

I must not think about drink!

An investigation into the relationship between thought suppression,
implicit cognition and drinking behaviour.

Michelle Taylor

Supervised by:

Dr Joanne Dickson

Professor Matt Field

Submitted:

9th June, 2014

Submitted in partial fulfilment of the Doctorate in Clinical Psychology,
University of Liverpool.

Acknowledgements

I would like to thank my supervisors Dr Joanne Dickson and Professor Matt Field for their guidance, expertise and support from beginning to end. I would also like to thank all who took part in the study and the staff at the unit, as without them this research would not have been possible. Thank you to all my friends and family for their support and patience over the past few years and my partner, Daniel, for believing in me.

Table of contents

	Page numbers
Introductory Chapter: Thesis overview	p1
Chapter 1: Literature Review	p4
Abstract	p5
Background	p6
Method	p9
Data searches and sources	p9
Study selection	p10
Data extraction and quality assessment	p11
Results	p15
Thought suppression and hyper-accessibility of alcohol-related thoughts	p15
Thought suppression, mindfulness and alcohol use	p16
Thought suppression and heart rate variability (HRV) in response to alcohol cues	p18
Discussion	p19
Limitations	p20
Clinical relevance	p21
Recommendations	p22
Conclusions	p22
References	p24
Chapter 2: Empirical Paper	p28
Abstract	p29
Introduction	p30

Method	p34
Design	p34
Participants	p34
Measures	p35
Procedure	p37
Data analysis	p38
Results	p39
Group Characteristics	p39
Visual Probe Task	p40
Correlations	p42
Discussion	p42
Limitations	p43
Clinical Implications	p44
Future Research	p44
Conclusions	p45
References	p46

List of Tables

Systematic Review:

Table 1. Study information and quality rating	p13
-----------------------------------------------	-----

Empirical Paper:

Table 1. AUDIT, AAAQ, WBSI and WBSI – adapted Data for Alcohol Dependent and Light Drinker Control Groups.	p40
------------------------------------------------------------------------------------------------------------------	-----

List of Figures

Systematic Review:

Figure 1. Study Selection Process	p11
-----------------------------------	-----

Empirical Paper:

Figure 1. An integrative model of attentional bias (taken from Field & Cox, 2008)	p31
--------------------------------------------------------------------------------------	-----

Figure 2. A bar chart to show mean RTs to the three trial types of the VPT 50ms by group.	p41
----------------------------------------------------------------------------------------------	-----

Figure 3. A bar chart to show mean RTs to the three trial types of the VPT 500ms by group.	p41
-----------------------------------------------------------------------------------------------	-----

List of Appendices

Appendix A: Author guidelines for Alcohol and Alcoholism	p52
Appendix B: Ethical Considerations	p61
Appendix C: Recruitment Advertisement	p64
Appendix D: Participant Information Sheets	p66
Appendix E: Consent Forms	p73
Appendix F: Questionnaires – AUDIT, AAAQ, TLFB, WBSI, WBSI-adapted version	p77
Appendix G: Statistical Power	p84
Appendix H: Data Screening	p86
Appendix I: Visual Probe Task	p89
Appendix J: Lay Summary	p93
Appendix K: Word count	p96

Thesis Overview

This thesis is divided into two main sections: a systematic review and an empirical paper. Supporting documents and supplementary information can be found in the appendices. Thesis sections and how they are linked will be outlined in this chapter.

Chapter 1 (Systematic Literature Review)

The aim of this chapter is to systematically review the role of thought suppression in alcohol use. Many alcohol-dependent patients undergoing treatment report using cognitive strategies such as suppression in their attempts to suppress thoughts or cravings about alcohol. However, the evidence on thought suppression suggests that this strategy can have paradoxical effects in that it makes the to-be-avoided thoughts more accessible (Wenzlaff & Wegner, 2000). Klein (2007) found that attempts to suppress alcohol-related thoughts made them hyper-accessible during an alcohol Stroop task in an abstinent alcohol-dependent group but not in a control group of social drinkers. Attempts have been made to counteract thought suppression using mindfulness-based practices (Bowen et al., 2007) as mindfulness encourages acceptance of thoughts rather than suppressing them (Kabat-Zinn, 1990). The findings are discussed in terms of their strengths, limitations, clinical implications and future research.

Given the evidence from the review, it was hypothesised that thought suppression was linked to attentional avoidance of alcohol-related cues as seen on measures such as the visual probe task i.e. when alcohol-dependent individuals make a deliberate effort to look away from the alcohol pictures presented for 500ms or longer. The empirical paper aimed to investigate this prediction.

Chapter 2 (Empirical Paper)

The empirical paper looks at the relationship between thought suppression, attentional bias and motivational conflict, which are well-known constructs associated with alcohol dependence. This study looked at these constructs concurrently in alcohol-dependent adults and a control group using self-reported data and a visual probe task.

Alcohol dependence is characterised by attentional bias for alcohol related stimuli. Research suggests that attentional bias is largely a result of classical conditioning following increased activation of dopaminergic responses in response to repeated use (Robinson and Berridge, 1993). Attentional bias and craving appear to have a reciprocal relationship. Field & Eastwood (2005) found that an increase in one led to an increase in the other resulting in increased alcohol consumption in heavy drinkers (Field & Eastwood, 2005).

Attentional bias can be seen on tasks such as the visual probe task (e.g. responding to a probe quicker when it replaces an alcohol cue rather than a neutral cue). It is also a useful way of measuring implicit approach and avoidance motivation. Previous research shows that when alcohol pictures are presented for short durations (e.g. 50ms) heavy drinkers and alcohol-dependent individuals show approach tendencies towards alcohol pictures. When alcohol pictures are presented for longer durations (e.g. 500ms) alcohol-dependent individuals show an attentional avoidance. Alcohol-dependent individuals also self-report strong approach and avoidance tendencies which suggest that motivational ambivalence is characteristic of alcohol-dependence.

The empirical paper aimed to study the relationship between the constructs above using explicit and implicit measures. It was considered whether attentional avoidance of alcohol cues reflects a person's attempts to suppress alcohol-related thoughts. The findings

are discussed in terms of their relationship to theoretical models of alcohol dependency, past research, strengths and limitations, clinical implications and future research.

References

- Bowen, S., Witkiewitz, K., Dillworth, T. M., & Marlatt, G. A. (2007). The role of thought suppression in the relationship between mindfulness meditation and alcohol use. *Addictive Behaviors, 32*, 2324 -28.
- Field, M., & Eastwood, B. (2005). Experimental manipulation of attentional bias increases the motivation to drink alcohol. *Psychopharmacology, 183*, 350-7.
- Kabat-Zinn, J. (1990). *Full catastrophe living: Using the wisdom of your mind to face stress, pain and illness*. New York: Dell Publishing.
- Klein, A. A. (2007). Suppression-induced hyperaccessibility of thoughts in abstinent alcoholics: A preliminary investigation. *Behaviour Research and Therapy, 45*, 169-177.
- Robinson, T. E., & Berridge, K. C. (1993). The neural basis of drug craving: an incentive-sensitization theory of addiction. *Brain Research Reviews, 18*, 247-291.
- Wenzlaff, R. M., & Wegner, D. M. (2000). Thought suppression. *Annual Review of Psychology, 51*, 59-91.

Chapter 1: Systematic Review

The role of thought suppression in alcohol use:

A systematic review

Abstract

The aim of this systematic review was to review the evidence for the role of thought suppression in alcohol use. The paradoxical effects of thought suppression have been well studied and there is evidence to suggest thought suppression plays a role in psychopathology. Thought suppression is a commonly reported strategy employed by substance users trying to suppress thoughts, cravings and urges for a given substance. The aim of this review was to explore the effect of using this strategy for alcohol-related thoughts on subsequent alcohol use. We hypothesised that thought suppression would have a paradoxical effect on people's thoughts and cravings about alcohol.

A systematic search in five electronic databases for studies published in the English language after 1994 was conducted. Studies were selected based on pre-determined criteria. Relevant information was extracted from the studies and tabulated and the quality of each paper was assessed. Of the 486 papers first identified, seven papers met the criteria.

The diversity of studies made it difficult to compare results; therefore, the studies were grouped and discussed in terms of their findings. The review concludes that the evidence suggests thought suppression does have an impact on alcohol use, particularly those who are trying to abstain. Suppression of alcohol-related thoughts results in even more thoughts, is negatively correlated with heart rate variability, and appears to mediate the relationship between a mindfulness-based treatment and subsequent alcohol use. Limitations of the studies and of the review itself are discussed. Clinical implications include assessing thought suppression in clinical settings, and education about the effects of suppression and the potential usefulness of third-wave therapies such as Mindfulness.

Key words: Thought suppression, alcohol, alcohol dependence, mindfulness, White Bear Suppression Inventory

Introduction

Thought suppression is a common form of mental control employed to block out certain thoughts; however, it often has the opposite effect. Thought suppression and its paradoxical effects have received considerable attention over the past 25 years, due to its links to psychopathology and more recently addiction. Studies have shown that attempts to suppress certain thoughts can result in an immediate increase in those thoughts (Wegner, Schneider, Carter, & White, 1987; Wenzlaff & Wegner, 2000). Wegner and colleagues named this ironic process theory. It is believed to involve two processes; one controlled (conscious) and one automatic (unconscious). The controlled process attempts to avoid the to-be-avoided thought by looking for distractors i.e. thinks of something else, until it is eventually terminated voluntarily by the individual or disrupted by cognitive demands. The automatic process operates outside of awareness and looks for the to-be-avoided thought or any associations and continues to operate after the controlled process stops. If it finds a to-be-avoided thought the controlled process is initiated again in an attempt to eliminate the thought.

Whereas some studies have found evidence of the paradoxical effects of suppression, others have not found evidence unless participants were under additional cognitive load. Wegner and Erber (1992) assessed hyper-accessibility of thoughts in those trying to suppress whilst trying to concentrate on another task such as a memory or time-pressured task. Participants gave target words in response to target related prompts more often during suppression when under time pressures compared to those who did not suppress and those not under time pressures. In addition, participants who were asked to suppress were also slower to name colours of words on a Stroop task under cognitive load in comparison to those in the 'no cognitive load' or 'no instruction to suppress' groups. These results support the ironic process theory. Suppression requires considerable cognitive resources, for example looking

for distracting thoughts whilst trying to suppress. It suggests that under cognitive load, the controlled process is impeded and the automatic process continues thus enhancing the accessibility of the suppressed thought. In real life circumstances cognitive load may be in the form of stress, arousal or busyness.

Other theories have been put forward with regards to explaining the paradoxical effects of suppression. One such theory is distractor associations. During their early studies Wegner, Schneider, Carter, and White (1987) observed that those who suppressed used distracters to divert their attention from the to-be-distracted thought. This led them to believe that unfocused distraction could be responsible for the rebound effects found after suppression attempts whereas single distracters reduced rebound effects. Unfocused distraction creates associations between the to-be-avoided thought and the distracters; therefore, when suppression stops previous distracters become reminders of the to-be-avoided thought thereby increasing their accessibility. However, this theory does not account for cognitive load effects.

An alternative theory is goal interruption (Martin, Tesser, & McIntosh, 1993). Martin et al. (1993) believed that post suppression rebound effects come from the motivation to fulfil a blocked goal. If a goal has not been achieved people are more likely to recall it as it remains active in our cognitive system. For example, if during suppression attempts a person has intermittent intrusions, this will mean the goal has not been fulfilled and when suppression attempts are stopped the memories of those failures stay with us and we become pre-occupied by the to-be-avoided thoughts. This theory however does not explain intrusive thoughts during suppression to begin with nor does it explain why focused self-distraction reduces rebound effects.

Metacognitions are thought to contribute to the effectiveness of thought suppression. Metacognition can be described simply as our thoughts about our thoughts. During cognitive

development we gain a sense that there are some thoughts we can control (i.e. suppression could succeed) and there are thoughts we cannot control. As well as the sense we can suppress some thoughts, we are also likely to suppress through fear of not having control over other thoughts. This is commonly seen in clinical presentations such as anxiety and depression (Wells, 2009). Whilst metacognitions most likely perpetuate attempts at mental control such as thought suppression, they do not explain ironic effects associated with thought suppression.

There is evidence for the role of thought suppression in psychopathology. Studies have examined the role of thought suppression in disorders such as post-traumatic stress syndrome (Harvey & Bryant, 1998), obsessive compulsive disorder (Janeck & Calamari, 1999) and depression (Wenzlaff & Bates, 1998). People often try to suppress unwanted symptoms, for example those who experience depression often report trying to suppress negative thoughts. The evidence suggests thought suppression plays a causal and maintenance role (Purdon, 1999) in psychopathology. People with mental health difficulties are often seen as experiencing more stress which could have the effect of exacerbating accessibility of thoughts due to depleted cognitive resources.

There is some evidence to suggest that thought suppression might have a role in addictive disorders. Trying not to think about the thing from which you are trying to abstain from is a common experience, for example trying not to think about smoking when you are trying to quit. Studies have shown that for those trying to quit smoking, suppressing thoughts about smoking can result in an increase of those thoughts and is associated with relapse (Salkovskis & Reynolds, 1994; Toll, Sobell, Wagner, & Sobell, 2001). However, in some research on thought suppression and addiction this has not been the case; Erskine, Ussher, Cropley, Elgindi, Zaman, and Corlett (2012) did not find that thought suppression increased subsequent cravings or smoking. Similarly, Reynolds, Valmana, Kouimtsidis, Donaldson,

and Ghodse (2005) found that suppression of substance-related intrusive thoughts did not increase the frequency of those thoughts in abstinent substance dependent adults seeking treatment. Given the mixed evidence, more studies are needed to examine the relationship between thought suppression and subsequent substance use.

If thought suppression does result in the hyper-accessibility of suppressed substance-related thoughts in substance-dependent adults this could have important clinical implications. Clinically, the evidence suggests therapy models such as mindfulness (Kabat-Zinn, 1990), acceptance and commitment therapy (Hayes, Strosahl, & Wilson, 2003) and metacognitive therapy (Wells, 1997), which encourage people to accept and de-center from their thoughts rather than suppress them, might be useful for some people. For example, being mindful can be considered the opposite state to suppressing one's thoughts. Mindfulness therapies promote acceptance and non-judgement towards thoughts. These therapies teach people that it is not the thoughts themselves that are the problem but the way we perceive and respond to them.

Despite the obvious links between thought suppression and addiction, few studies have investigated the impact of suppression on substance-related thoughts hence the low number of studies in this review. The current review collates studies which provide evidence for the role of thought suppression in alcohol use. The main questions were as follows: Does suppressing thoughts or cravings about alcohol make you more likely to have those thoughts or cravings? If this is this case, does this hyper-accessibility make you more likely to consume alcohol?

Method

Data searches and sources

The databases PubMed, PsycINFO, Scopus, Web of Knowledge and Science Direct were searched. In addition SIGLE was searched for unpublished papers. The reference lists of

the papers selected were used to screen for other possible papers which might have been missed. The searches were for the period 1994 to the present day as the White Bear Suppression Inventory (Wegner & Zanakos, 1994), an established measure of thought suppression, was published in 1994. The search was restricted to papers written in the English language. Initially, the search terms used were thought suppression* OR mental control* combined with alcohol* OR alcohol dependent*; however, the term alcohol dependent* was removed as this limited the number of studies to five. A prominent researcher in the field was approached by email for any relevant unpublished or 'in press' papers; however, this did not yield any more studies.

Study selection

The process above resulted in 486 papers. Abstracts were screened then potential papers were screened using the inclusion/exclusion criteria. Papers were included if they had an adult population, they were specifically looking at alcohol use as opposed to other substances and they included a thought suppression task or measure. Papers were excluded if they were not written in English or animal studies. Dissertations were not included. A total of seven papers met the above criteria (see Figure 1).

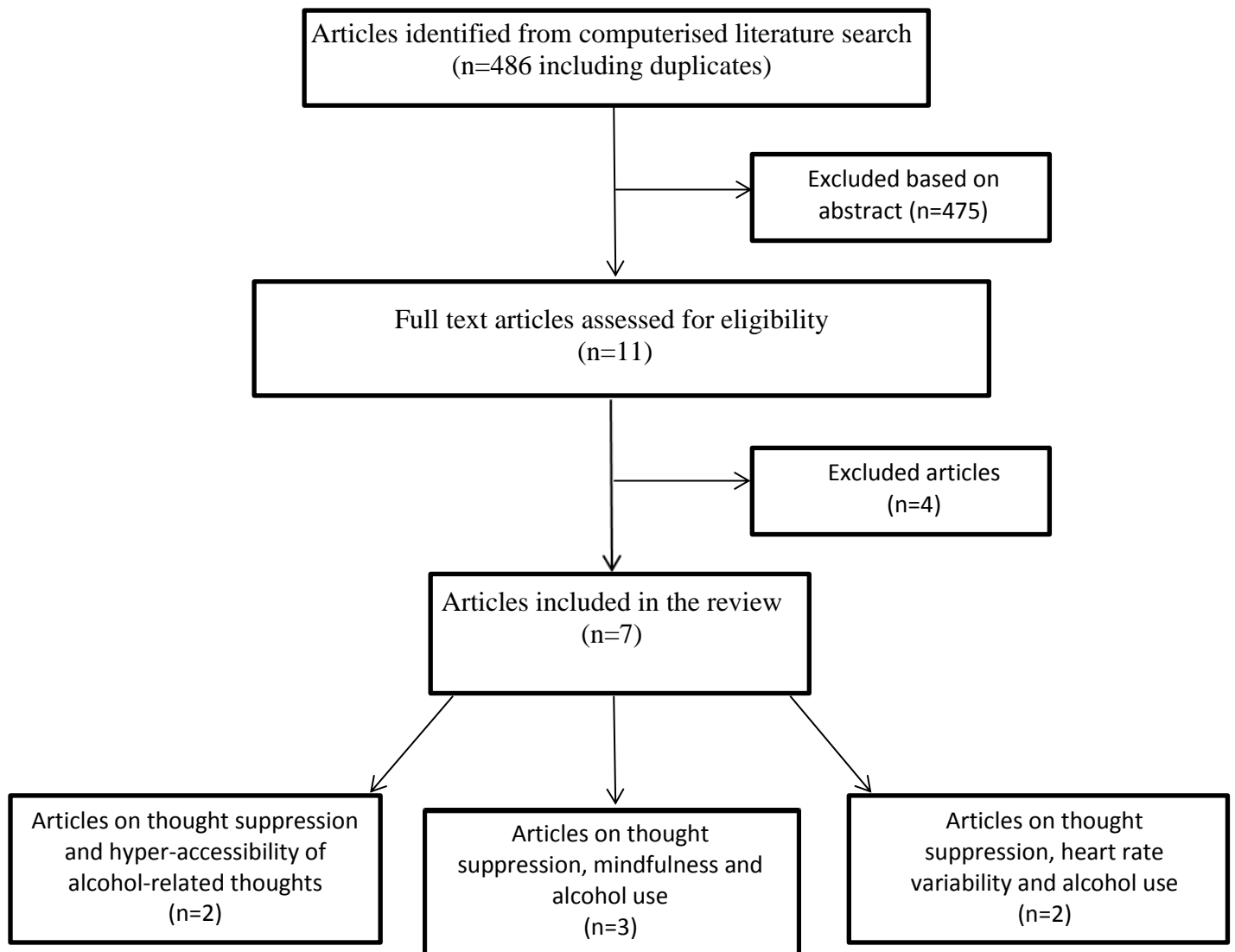


Figure 1. Study Selection Process

Data extraction and quality assessment

Information on the study design, population, aims, measures, main findings and quality were extracted and tabulated (see Table 1). The methodological quality of each of the studies was assessed using the Quality Assessment Tool for Studies with Diverse Designs (QATSDD; Sirriyeh, Lawton, Gardner & Armitage, 2011). The QATSDD is a 16-item quality assessment tool that can be applied to a range of research designs e.g. cross-sectional, randomized control trials and qualitative methods and has been shown to have good

reliability and validity (Sirriyeh et al., 2011). Given the mixture of papers found, this quality assessment tool seemed most appropriate. Scores can range from 0 to 42; however, the authors of this tool do not report a cut-off value. The papers in this review all provided a strong theoretical framework for their research, stated their objectives clearly and the analytic method seemed appropriate to their study. However, none involved service users in any part of the research design process, there was very little information about data collection procedures (e.g. dropout rates) and none gave a rationale for choice of data collection tools.

Table 1

Study characteristics, main findings and quality rating

Study authors	Design	Population	Aims	How suppression was measured	Findings	Quality Rating
Garland al., 2012	Cross-sectional	n=58 alcohol-dependent adults in residential treatment for ≥ 18 months, no substance use during that time, mostly male (81%), and African-American (55.2%)	Investigate whether state and trait suppression, impaired regulation of urges and alcohol attentional bias would have significant effects on heart rate variability (HRV)	Trait suppression was measured using the WBSI (Wegner & Zanakos, 1994) State suppression was measured using a self-report measure post exposure	Impaired regulation of alcohol urges was significantly associated with state suppression of thoughts of drinking during alcohol-cue exposure. Trait thought suppression was significantly associated with increases in stress ($r=.34$, $p=.01$) and craving ($r=.38$, $p=.005$) from baseline through cue exposure	22
Ingjaldsson et al., 2003	Experimental	n=49 alcohol-dependent individuals receiving inpatient treatment (mean age=45.4) and n=45 control subjects (mean age=42) recruited from telephone survey	Investigate HRV in two groups before, during and after exposure to an alcohol-related imaginary script	WBSI (Wegner & Zanakos, 1994)	Alcohol-dependent individuals had a faster heart rate and lower HRV compared to the control group pre-exposure. An increase was observed in HRV in the alcohol-dependent group during exposure to the imaginary alcohol script. Tonic HRV was found to be inversely related to negative mood and chronic thought suppression	26
Bowen et al., 2007	Pre/post treatment	n=173 (81 complete) imprisoned adults, mean age=37.4, SD=8.6, and 79% male, 61% Caucasian	Investigate the effects of a 10-day Vipassana course on substance use in an incarcerated population	WBSI (Wegner & Zanakos, 1994)	The WBSI was split into two sub-scales: thought avoidance and intrusive thoughts. Change in levels of thought avoidance partially mediated the relationship between Vipassana course participation and alcohol use three months following release from jail	23
Garland et al., 2013	Cross-sectional	n=125 individuals with extensive trauma histories who met criteria for one or more substance dependence diagnosis (66 met criteria for alcohol dependence)	Investigate the roles of mindfulness and suppression in comorbid post-traumatic stress and craving	WBSI (Wegner & Zanakos, 1994)	Extent of trauma history and post-traumatic stress symptoms were significantly positively associated with thought suppression. Thought suppression was also significantly negatively associated with dispositional mindfulness	24

Study authors	Design	Population	Aims	How suppression was measured	Findings	Quality Rating
Palfai et al., 1997	Experimental	n=40 adults (18-30 years old) identified as moderate to heavy drinkers who drank beer, 90% Caucasian, 52% male	Investigate whether the effects of suppressing the urge for alcohol would heighten accessibility of alcohol-related information	Participants were instructed to either suppress the urge to drink alcohol or given no instruction. Participants were asked to record the number of failed suppression attempts	Participants asked to suppress made significantly faster alcohol expectancy judgements	18
Klein, 2007	Experimental	n=38 abstinent individuals (26 male, 12 female) recruited from Alcoholics Anonymous groups, n=36 control participants (18 male, 18 female) recruited via flyers	Investigate whether abstinent alcohol-dependent individuals would show suppression-induced hyper-accessibility	Self-report post experiment: participants were asked to rate how hard they tried to suppress the target words and how difficult they found it	Alcohol-dependent individuals took significantly longer to name the colour of the word 'alcohol' after they had been instructed to suppress thoughts of alcohol	24
Garland et al., 2010	RCT trial Pre/post treatment	n=53 alcohol-dependent adults residing in therapeutic community for ≥ 18 months, majority male (79.2%) and African-American (60.4%)	Investigate the effects of mindfulness training on the mechanisms implicated in alcohol dependence	WBSI (Wegner & Zanakos, 1994)	Mindfulness training significantly reduces stress and thought suppression	35

Results

A total of seven studies met the criteria. Due to the variability of the studies they could not be compared easily and therefore the studies have been grouped in terms of their findings and discussed narratively. Limitations of the studies and the review as a whole are discussed later in the review (see Discussion).

Thought suppression and hyper-accessibility of alcohol-related thoughts

Consistent with the literature on hyper-accessibility of thoughts following suppression, Klein (2007) found that abstinent alcoholics' attempts to suppress thoughts of alcohol made those thoughts hyper-accessible immediately after the suppression attempt. This effect was not found in the control group or the abstinent alcoholics who were not instructed to suppress. Hyper-accessibility was demonstrated by longer reaction times to the word "alcohol" than other words on a Stroop task. This suggests that suppressing alcohol-related thoughts under cognitive load (participants were asked to remember an 8-digit number) may actually increase the accessibility of those thoughts in abstinent alcoholics, at least immediately after the suppression attempt. It also suggests hyper-accessibility of alcohol thoughts following suppression is unique to abstinent alcoholics. To replicate previous studies, following the alcohol suppression task Klein also asked participants to suppress thoughts about a house. Inconsistent with Wegner and Erber's study (Wegner & Erber, 1992), neither abstinent alcoholics nor controls showed a suppression effect for the word "house". The researchers hypothesised whether participants followed the instructions; however, given the number of thought intrusions recorded this seemed unlikely. This might suggest that thought suppression only induces hyper-accessibility for thoughts which are emotionally salient to the individual. The current evidence is mixed and requires further investigation.

Palfai and colleagues (Palfai, Monti, Colby, & Rohsenow, 1997) investigated suppressing the urge to drink on hyper-accessibility, more specifically the accessibility of alcohol outcome expectancies, in heavy social drinkers. Alcohol outcome expectancies included positive and negative anticipated outcomes of drinking alcohol. Positive alcohol outcome expectancies are expectations that drinking alcohol will result in desirable effects e.g. confidence in social situations. Negative alcohol outcome expectancies are expectations that drinking alcohol will lead to undesirable outcomes e.g. feel unwell. Studies have found alcohol outcome expectancies central to cognitive processing models of alcohol use and dependence (Oei & Baldwin, 1994). Those who were instructed to suppress their urge to drink made significantly faster alcohol expectancy judgements compared to those who were not instructed to suppress. In addition, positive alcohol outcome expectancies were more accessible. Positive alcohol outcome expectancies, as opposed to negative outcome expectancies, are associated with higher drinking and consumption rates (Goldman, Del Boca, & Darkes, 1999).

Klein suggests that mindfulness interventions might be useful for those in recovery who experience distressing or intrusive thoughts about alcohol. Mindfulness encourages people to respond to these thoughts in a non-judgemental and accepting way rather than avoiding them through suppression attempts. The following studies look at the relationship between thought suppression, mindfulness and subsequent alcohol use.

Thought Suppression, Mindfulness and Alcohol Use

Three studies (Bowen, Witkiewitz, Dillworth, & Marlatt, 2007; Garland, Gaylord, Boettiger & Howard et al., 2010; Garland & Roberts-Lewis, 2013) looked at the relationship between thought suppression, mindfulness and alcohol use. Mindfulness (trait) is having a non-reactive, non-judgmental and present awareness of mental processes (Garland, 2007). Despite the fact the sample were adults with trauma histories and substance abuse, Garland et

al.'s study (2013) was included in the review as the majority of the sample were being treated for alcohol dependence, which was deemed appropriate. The extent of their trauma history was associated positively with thought suppression and their post-traumatic stress symptom level was significantly positively correlated with thought suppression and craving. Given that thought suppression is considered to be the opposite of dispositional mindfulness, it was not surprising that dispositional mindfulness was significantly negatively correlated with extent of trauma history and post-traumatic stress symptom level. Overall the results suggest that the relationship between traumatic events and post traumatic symptoms is mediated by thought suppression in alcohol-dependent individuals; however, thought suppression did not statistically mediate the relationship between post-traumatic stress and craving. Similar to the findings on hyper-accessibility, they suggest that thought suppression may have the opposite effect intended on post-traumatic stress symptoms which results in a reduction of cognitive resources needed to regulate urges.

Bowen and colleagues' study suggests that thought suppression partially mediated the relationship between participation in a 10-day mindfulness course and subsequent alcohol use in an incarcerated population. Those who participated reported significantly less thought avoidance. Interestingly, the mindfulness course participants did not report a decrease in intrusive thoughts, which suggests that the frequency of thoughts is less important than how they are perceived and acted upon.

In a similar study, Garland and colleagues (2010) looked at the effect of mindfulness on cognitive, affective and physiological mechanisms implicated in alcohol dependence. This study scored the highest on the QATSSD. In a randomised control pilot trial 53 participants were assigned to either the mindfulness-oriented recovery enhancement (MORE) intervention or to an evidence-based alcohol dependence support group (ASG). Consistent with Bowen and colleagues (2007), the MORE intervention significantly reduced thought suppression as

well as other mechanisms involved in alcohol dependence. Overall the evidence suggests that mindfulness approaches target mechanisms involved in alcohol dependence and therefore might be useful treatments for alcohol-dependent individuals.

Thought Suppression and Heart Rate Variability (HRV) in Response to Alcohol Cues

Garland, Carter, Ropes, and Howard (2012) and Ingjaldsson, Laberg, and Thayer (2003) studied heart rate variability (HRV) in alcohol-dependent adults; controls were also used in the latter study. HRV is the variation in time interval between heart beats. Research suggests it may be an important factor in various psychopathologies. Thayer and Lane (2000) propose an integrated physiologic model for understanding cognitive, emotional and behavioural regulation. Researchers propose that defects in neurovisceral regulation of affective experiences (seen in conditions such as anxiety) may be explained by faulty inhibitory function in the nervous system. Tonic HRV may be a physiologic indicator of this. High levels of HRV are related to cognitive flexibility (Johnsen et al., 2003). Reduced HRV has been found in clinical presentation such as anxiety and panic disorder but has not been studied extensively in alcohol dependence despite evidence that suggest it may play a role, for example the acute effects of alcohol on reductions in HRV (Reed, Porger, & Newlin, 1999). In short, high tonic levels of HRV are associated with flexible deployment of resources to meet environment demands, and low HRV is associated with having “locked in attention” (Porges, Roosevelt, Portales, & Greenspan, 1996). Ingjaldsson and colleagues (2003) hypothesised that alcohol-dependent subjects would have lower HRV than the control group (non-alcohol-dependent) and HRV would increase after exposure to an alcohol-related imaginary script which might reflect compensatory coping. The alcohol-dependent group did have lower HRV compared to the control group and HRV did increase in the alcohol-dependent group when exposed to the alcohol script. More importantly, there was a significant negative correlation between thought suppression and HRV, mainly in the

alcohol-dependent group which supports the integration model. This study claims to be the first to make a link between physiologic indicators of cognitive inflexibility (low HRV) and thought suppression, and suggests that inhibitory mechanism may play an important role in relapse prevention.

Garland et al. (2012) found similar results in a group of abstinent alcohol-dependent adults residing in residential treatment for 18 months or longer. Individuals with higher levels of thought suppression had lower HRV during cue exposure which included pictures of alcohol. Similar to previous studies the participants were significantly slower at naming the colour of alcohol-related photos than neutral photos on a pictorial addiction-Stroop task. Further analysis showed a state suppression by trait suppression interaction on HRV responsivity. HRV responsivity in this study showed changes in HRV between baseline and alcohol cue exposure. Alcohol-dependent individuals with high trait suppression (i.e. scored high on the WBSI) who engaged in high levels of state suppression (tried to suppress thoughts of drinking during the cue exposure) had lower HRV responsivity, whereas those with low trait suppression who engaged in high levels of state suppression had greater HRV responsivity suggesting that trait thought suppression is key to HRV responsivity. This supports the evidence that thought suppression overloads regulatory resources. The results suggest that alcohol-dependent people with high levels of thought suppression and impaired regulation of alcohol urges have deficits in autonomic flexibility and inhibitory capacity.

Discussion

Overall the studies suggest that suppressing thoughts about alcohol makes those thoughts more accessible in heavy drinkers and alcohol-dependent adults (Klein, 2007; Palfai et al., 1997). Two studies found evidence that suppression attempts increased the accessibility of thoughts. This is important information for people trying to abstain from alcohol who might use such strategies. It might be helpful to educate people about the paradoxical effects

of these strategies. Thought suppression appears to be inversely related to dispositional mindfulness and mindfulness training significantly reduced thought suppression in alcohol-dependent adults (Garland et al., 2010; Garland & Roberts-Lewis, 2013) and subsequently alcohol use (Bowen et al., 2007).

Limitations

A number of limitations were identified from the studies and the review itself. Firstly, the number of studies found was small. This was partly due to the inclusion criteria but also due to the area being under researched. Although the selection process was systematic, the process was conducted by one reviewer. Ideally this should have been done by at least two reviewers to limit bias. Only one randomised control trial (pilot) was found. The remaining studies were a mixture of experimental and cross-sectional research and therefore causal relationships cannot be drawn from all studies.

Participants varied in terms of their scores on measures of alcohol dependence and length of abstinence within the studies. Ideally future studies could attempt to match participants on level of abstinence or compare different groups (e.g. pre-treatment, during treatment, 3 months post treatment) as other studies suggest the differences in abstinence could confound the results (e.g. Johnsen, Thayer, Laberg, & Asbjornsen, 1997). In addition, two of the studies recruited alcohol-dependent participants who had been residing in therapeutic communities and had remained abstinent for at least 18 months. They were also self-selected. All of these factors may have had an impact on the results.

Most of the studies in this review consisted of small sample sizes which limited the statistical power and generalizability of the findings. Bowen et al. (2007) reported a high attrition rate; at three months 47% could not be followed up which also limited the study's statistical power. Ingjaldsson et al. (2003) reported socio-demographic differences between the alcohol-dependent and control group; however, this is commonly found in studies

comparing an alcohol-dependent group with a non-dependent sample and when controlled for it made no difference to the results. Medication, on the other hand, may have affected participants' autonomic activity; the author's report that a large number of participants were taking medication that could have affected their responses.

Garland and Lewis (2013) investigated thought suppression, dispositional mindfulness, and post-traumatic stress symptoms and craving. Despite all participants having trauma histories only 23 of the 125 participants met the criteria for post-traumatic stress disorder (PTSD). They acknowledged this was a limitation as it did affect the results. Those who met the criteria for PTSD reported significantly higher levels of thought suppression and craving and lower levels of dispositional mindfulness. Only 52.8% of the participants met the criteria for alcohol-dependence; however, this was still considered a suitable study for the review.

Clinical relevance

All studies reviewed have clinical implications. They all suggest a link between thought suppression and alcohol use. They suggest that suppression results in a hyper-accessibility of thoughts or cravings (Palfai et al, 1997; Klein, 2007) which are associated with subsequent alcohol use. Therefore, it might be useful for clinicians to assess levels of thought suppression prior to treatment and warn people about the paradoxical effects of using this strategy. Thought suppression appears to be inversely related to trait mindfulness and mindfulness training leads to reduced stress and thought suppression (Garland, 2010). Some studies seem to suggest that lack of mindfulness could be a potential risk factor and warning sign to clinicians. Many of the studies advocate that mindfulness-based interventions might be useful for alcohol-dependent individuals trying to abstain from alcohol rather than using counterproductive strategies such as thought suppression.

Recommendations

More research is needed to further investigate the role of thought suppression and its relationship with alcohol use. The majority of studies in this review had small samples. Future studies require bigger samples in order to meet statistical power. The studies included in this review consisted mainly of treatment seeking abstinent alcoholics; however future research could target non-treatment seeking individuals too as this might affect their level of motivation and subsequently the strategies they use. As previously mentioned, length of abstinence may have an effect on cognitive strategies such as thought suppression; therefore, studies could investigate how length of abstinence might affect the results. Garland et al. (2010) suggest a more thorough integration of methods in future research such as using the dot probe task, the Stroop test and psychophysiological cue reactivity. Links between thought suppression and constructs central to alcohol dependence such as attentional bias and alcohol outcome expectancies were found which warrant further research.

Conclusion

The findings of this literature review suggest that thought suppression is a factor in alcohol use in heavy social drinkers and abstinent alcohol-dependent adults. Suppression of alcohol-related thoughts induced hyper-accessibility of alcohol-related thoughts. Thought suppression was also found to partially mediate the relationship between participation on a mindfulness meditation program and subsequent alcohol use. High levels of thought suppression were linked to less HRV responsivity to stress-primed alcohol cues in alcohol-dependent adults. Alcohol-dependent adults with greater tendency to suppress thoughts had lower HRV during exposure to alcohol cues which implies they had “locked in attention” as opposed to cognitive flexibility. The studies as well as the review itself have their limitations as previously discussed and future research is needed to increase our knowledge of the intricacies of thought suppression so that those with alcohol dependence and other addictions

can be fully informed about the consequence of engaging in suppression. More research is needed also on alternative strategies to thought suppression, such as mindfulness, for people with substance dependence so we can better support people in their treatment.

References

- Bowen, S., Witkiewitz, K., Dillworth, T. M., & Marlatt, G. A. (2007). The role of thought suppression in the relationship between mindfulness meditation and alcohol use. *Addictive Behaviors, 32*, 2324-2328.
- Erskine, J. A. K., Ussher, M., Cropley, M., Elgindi, A., Zaman, M., & Corlett, B. (2012). Effect of thought suppression on desire to smoke and tobacco withdrawal symptoms. *Psychopharmacology, 219(1)*: 205-211.
- Garland, E. L. (2007). The meaning of mindfulness: A second-order cybernetics of stress, metacognition, and coping. *Complementary Health Practice Review, 12(1)*: 15-30.
- Garland, E. L., Carter, K., Ropes, K., & Howard, M. O. (2012). Thought suppression, impaired regulation of urges, and addiction-stroop predict affect-modulated cue-reactivity among alcohol dependent adults. *Biological Psychology, 82*, 87-93.
- Garland, E. L., Gaylord, S. A., Boettiger, C. A., & Howard, M. O. (2010). Mindfulness training modifies cognitive, affective, and physiological mechanisms implicated in alcohol dependence: Results of a randomised controlled pilot trial. *Journal of Psychoactive Drugs, 42(2)*, 177-192.
- Garland, E. L., & Roberts-Lewis, A. (2013). Differential role of thought suppression and dispositional mindfulness in posttraumatic stress symptoms and craving. *Addictive Behaviors, 38*, 1555-1562.
- Goldman, M. S., Del Boca, F. K., & Darkes, J. (1999). Alcohol expectancy theory: The application of cognitive neuroscience. In H. T. Blane, & K. E. Leonard (Eds.), *Psychological theories of drinking and alcoholism* (pp 203-246). New York: Guildford Press.
- Harvey, A. G., & Bryant, R. A. (1998). The effect of attempted thought suppression in acute stress disorder. *Behaviour Research Therapy, 36*: 583– 90.

- Hayes, S. C., Strosahl, K., & Wilson, K. (2003). *Acceptance and commitment therapy: An experimental approach to behaviour change*. New York: Guildford Press.
- Ingjaldsson, J. T., Laberg, J. C., & Thayer, J. F. (2003). Reduced heart rate variability in chronic alcohol abuse: Relationship with negative mood, chronic thought suppression, and compulsive drinking. *Society of Biological Psychiatry*, 54, 1427-1436.
- Janeck, A. S., & Calamari, J. E. (1999). Thought suppression in obsessive-compulsive disorder. *Cognitive Therapy and Research*, 23: 5, 497-509.
- Johnsen, B. H., Thayer, J. F., Laberg, J. C., & Asbjornses, A. E. (1997). Attentional bias in active smokers, abstinent smokers, and nonsmokers. *Addictive Behaviors*, 22, 813-817.
- Johnsen, B. H., Thayer, J. F., Laberg, J. C., Wormnes, B., Raadal, M., Skaret E.,...Berg, E. (2003). Attentional and physiological characteristics of patients with dental anxiety. *Journal of Anxiety Disorders*, 17:75-87.
- Kabat-Zinn, J. (1990). *Full Catastrophe Living: Using the Wisdom of your Mind to Face Stress, Pain and Illness*. New York: Dell Publishing.
- Klein, A. A. (2007). Suppression-induced hyperaccessibility of thoughts in abstinent alcoholics: A preliminary investigation. *Behaviour Research and Therapy*, 45, 169-177.
- Martin, L. L., Tesser, A., & McIntosh, W.D. (1993). Wanting but not having: the effects of unattained goals on thoughts and feelings. In Wegner, D. M., & Pennebaker, J. W. (Eds.) *Handbook of Mental Control* (pp. 552-572). Englewood Cliffs, NJ: Prentice-Hall.
- Oei, T. P. S., & Baldwin, A.R. (1994). Expectancy theory: A two process model of alcohol use and abuse. *Journal of Studies on Alcohol*, 55, 525-534.

- Palfai, T. P., Monti, P. M., Colby, S. M., & Rohsenow, D. J. (1997). Effects of suppressing the urge to drink on the accessibility of alcohol outcome expectancies. *Behaviour Research and Therapy*, 35, 59-65.
- Porges, S. W., Roosevelt, J. A., Portales, A. L., & Greenspan, S. I. (1996). Infant regulation of the vagal “break” predicts child behaviour problems: A psychobiological model of social behavior. *Developmental Psychobiology*, 29:697–712.
- Purdon, C. (1999). Thought suppression and psychopathology. *Behaviour Research and Therapy*, 37(11):1029-54
- Reed, S. W., Porges, S. W., & Newlin, D. B. (1999). Effect of alcohol on vagal regulation of cardiovascular function: Contributions of the polyvagal theory to the psychophysiology of alcohol. *Experimental and Clinical Psychopharmacology*, 7:484–492.
- Reynolds, M., Valmana. A., Kouimtsidis, C., Donaldson, C., & Ghodse, H. (2005). An investigation of descriptive and experimental aspects of intrusive thoughts in a sample of substance-dependent inpatients. *Addiction Research and Theory*, 13, 4, 347 -357.
- Salkovskis, P. M., & Reynolds, M. (1994). Thought suppression and smoking cessation. *Behaviour Research and Therapy*. 32:193–201.
- Sirriyeh, R., Lawton, R., Gardner, P. H., & Armitage, G. J. (2012). Reviewing studies with diverse designs: The development and evaluation of a new tool. *Journal of Evaluation in Clinical Practice*, 16 (4), 746-752.
- Thayer, J. F., & Lane, R. D. (2000). A model of neurovisceral integration in emotion regulation and dysregulation. *Journal of Affective Disorders*, 61(3):201-16.
- Toll, B. A., Sobell, M. B., Wagner, E.F., & Sobell, L. C. (2001). The relationship between thought suppression and smoking cessation. *Addictive Behaviors*, 26(4):509-15.

- Wegner, D.M., & Erber, R. (1992). The hyperaccessibility of suppressed thoughts. *Journal of Personality and Social Psychology*, 63: 903–12.
- Wegner, D. M., Schneider, D. J., Carter, S., & White, T. (1987). Paradoxical effects of thought suppression. *Journal of Personality and Social Psychology*, 53, 5-13.
- Wegner, D. M., & Zanakos, S. (1994). Chronic thought suppression. *Journal of Personality*, 62, 615-640.
- Wells, A. (1997). *Cognitive therapy for anxiety disorders: A practice manual and conceptual guide*. Chichester: Wiley.
- Wells, A. (2009). *Metacognitive therapy for anxiety and depression*. London: Guildford Press.
- Wenzlaff, R. M., & Bates, D. E. (1998). Unmasking a cognitive vulnerability to depression: How lapses in mental control reveal depressive thinking. *Journal of Personality and Social Psychology*, 75: 1559–1571.
- Wenzlaff, R. M., & Wegner, D. M. (2000). Thought suppression. *Annual Review of Psychology*, 51: 59-91.

Chapter 2: Empirical Paper

I must not think about drink!

An investigation into the relationship between thought suppression,
implicit cognition and drinking behaviour¹

¹ This manuscript will be submitted to Alcohol and Alcoholism (4000 word limit excluding tables), author guidelines can be found in appendix A.

Abstract

Background

Attentional bias and motivational conflict are characteristics of addiction. In addition, many people trying to abstain from substances report using strategies such as thought suppression to suppress cravings or thoughts about the substance. The aims of this study were to compare alcohol-dependent patients and controls on thought suppression, attentional bias and approach and avoidance motivation for alcohol, and to investigate inter-relationships between these constructs in alcohol-dependent patients.

Method

A total of 64 alcohol-dependent patients and 52 controls completed a visual probe task (VPT) designed to measure attentional bias for alcohol cues. Participants completed self-report measures of approach and avoidance tendencies for alcohol and thought suppression.

Results

The alcohol-dependent group scored higher on thought suppression measures, indicating higher levels of thought suppression, and intense approach and avoidance tendencies. In contrast to the explicit measures, the alcohol-dependent group did not show an attentional avoidance of alcohol cues presented for 500ms, relative to controls.

Conclusions

This was the first study to look at thought suppression and attentional bias concurrently within an alcohol-dependent and a control group using implicit and explicit measures. Thought suppression appeared to be unrelated to attentional avoidance of alcohol cues as predicted.

Key words: Alcohol dependence, attentional bias, motivational conflict, thought suppression, visual probe task

Introduction

Motivational conflict is central to alcohol dependence. Alcohol-dependent patients often report the motivation to stop drinking (avoid) at the same time as wanting to drink (approach). Research suggests that approach and avoidance tendencies are two independent motivational systems (Breiner et al., 1999). The ambivalence model (Breiner et al., 1999) posits that alcohol use depends on the balance between the two. Individuals can fall into one of four categories. Those with low motivation to both avoid and approach alcohol are likely to fall within the 'indifferent' category; these people tend to be light drinkers. People with high motivation to approach alcohol and low motivation to avoid it are likely to fall within the 'approach' category; who tend to be heavy drinkers. People with high motivation to avoid and low motivation to approach alcohol fall within the 'avoidant' category and are likely to be non-drinkers. Finally, people who are highly motivated to both approach and avoid alcohol fall within the 'ambivalent' category; research suggests that alcohol-dependent patients typically fall within this category.

Motivational states affect several cognitive processes including attention. Attentional bias is the tendency for certain stimuli, often emotionally salient, to capture our attention. Attentional bias of stimulus reflects approach motivation whilst attentional avoidance reflects the motivation to avoid. Heavy drinkers and alcohol-dependent individuals often show attentional bias for alcohol-related cues (for a review, see Field & Cox, 2008). Research suggests that attentional bias for alcohol-related cues develops as a result of classical conditioning, through repeated pairing of alcohol cues with pleasant effects (e.g. dopaminergic activity) which become sensitised. The substance then becomes emotionally salient and obtaining it becomes an important goal leading to attentional bias and craving (Robinson & Berridge, 1993; Franken, 2003). A meta-analysis by Field et al. (2009) suggests

attentional bias and craving are positively correlated. Field and Cox (2008) have combined models of substance-related attentional bias into one, as presented in Figure 2.

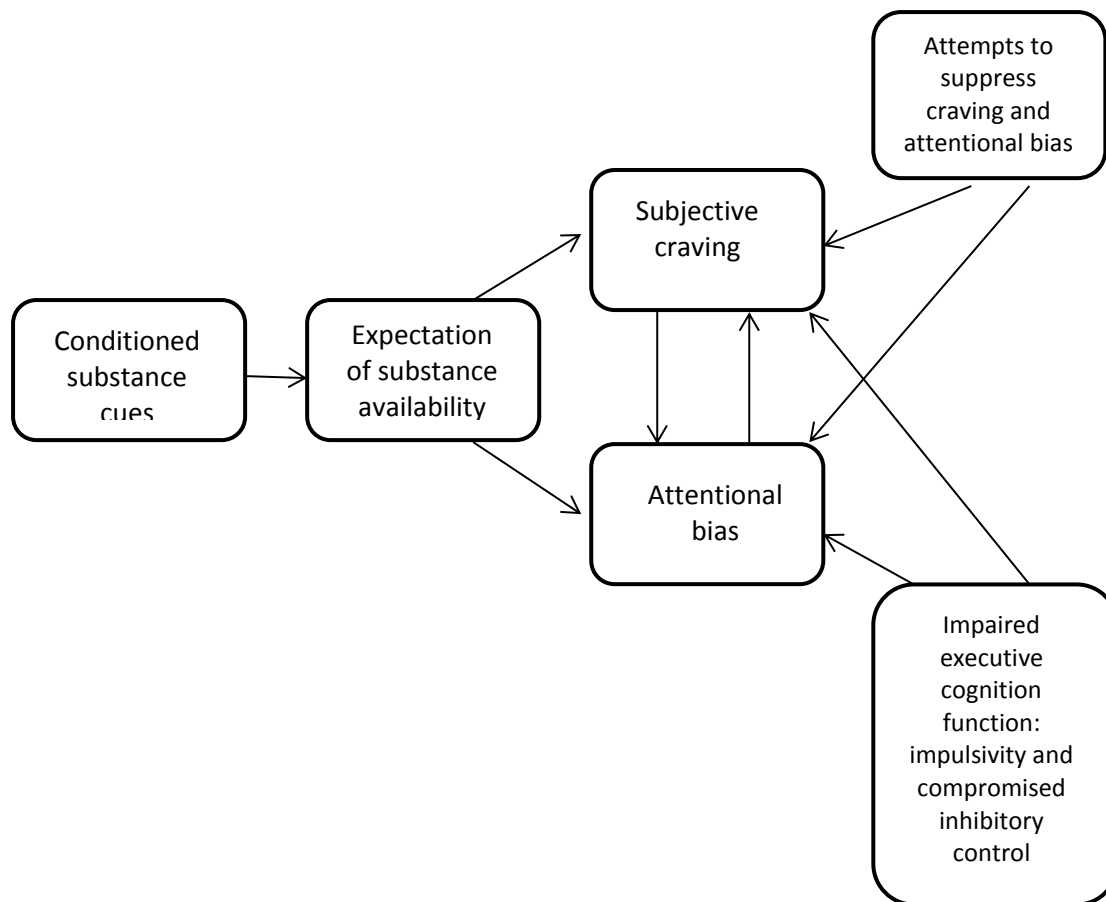


Figure 1. An integrative model of attentional bias (Field & Cox, 2008)

To elaborate, attentional bias is the product of conditioning and the expectation of the substance becoming available. Attentional bias and craving have an excitatory relationship. Alcohol-dependent individuals trying to abstain will attempt to suppress their craving and attentional bias. In addition impaired executive control (as a result of prolonged alcohol dependence) might inhibit controlled processes making automatic approach tendencies (e.g. attentional bias) stronger.

These implicit/automatic processes (attentional bias and motivational tendencies) are thought to be central to alcohol dependence. Implicit cognitive processes are spontaneous, fast and operate outside of awareness whilst explicit processes are slower, deliberate and operate within awareness; this forms the basis of dual process theories (e.g. Wiers & Stacy, 2006). According to the incentive-sensitization theory (Robinson & Berridge, 1993) alcohol use begins as an explicit process then becomes implicit due to the activation of neural pathways and classical conditioning. These theories combined (dual process, ambivalence model, incentive-sensitization) offer an explanation of why alcohol-dependent individuals often self-report avoidance tendencies on explicit measures at the same time as displaying approach tendencies on implicit measures (Barkby et al., 2012; Dickson et al., 2013). Explicit measures include the approach and avoidance of alcohol questionnaire (AAAQ) (McEvoy et al., 2004) and the visual probe task (VPT) measures more implicit processes.

Evidence suggests that continued drug use results in changes to the brain resulting in impulsive systems becoming stronger i.e. more sensitised to drug cues, which then capture the attention of the user (attentional bias). Alcohol-dependent individuals report high approach tendencies at the same time as high avoidance tendencies (motivational ambivalence). Alcohol use depends on which motivational system is strongest at the time. Some studies have found that alcohol-dependent patients show an attentional avoidance for alcohol cues presented for 500ms on the VPT (Noel et al., 2006; Townshend & Duka, 2007). These results suggest that a strategy could be being utilised by those trying to avoid alcohol. According to Field and Cox (2008), thought suppression is a strategy employed to avoid substance-related thoughts and cravings. Thought suppression is a common form of mental control used to block out unwanted thoughts; however, evidence suggests it has a paradoxical effect (Wenzlaff & Wegner., 2000). Wegner and colleagues termed this ironic process theory (Wegner et al., 1987). It is thought to involve two processes; one controlled/conscious and

one automatic/unconscious. The controlled process attempts to avoid the thought by looking for distractors which eventually terminates. The automatic process operates outside of awareness looking for the to-be-avoided thought or associations and continues to operate after the controlled process stops. If it finds the thought/association this re-starts the controlled process in an attempt to eliminate the thought.

Thought suppression and its paradoxical effects have been researched by instructing people to suppress or not to suppress target thoughts followed by a Stroop task to measure interference. Some studies have only found hyper-accessibility when other cognitive demands were placed on the individual (Wegner & Erber, 1992), such as a memory task. Given that suppression requires considerable cognitive resources, additional cognitive load impedes the controlled process whilst the automatic process continues, thus enhancing the accessibility of the suppressed thought. Klein (2007) found that abstinent alcoholics' attempts to suppress alcohol-related thoughts under cognitive load made the thoughts hyper-accessible immediately after the suppression attempt. This effect was not found in the groups that were not instructed to suppress. Palfai et al. (1997) found that suppressing the urge to drink resulted in heavy drinkers making significantly faster positive alcohol expectancy judgements compared to those who did not suppress. Positive alcohol expectancies (expectations that alcohol will have desirable consequences) are associated with higher alcohol consumption (for a review, see Jones et al., 2001).

Despite the potential links between attentional avoidance and thought suppression, few studies have looked at these processes concurrently in an alcohol-dependent population. This study looked at attentional bias, approach and avoidance motivation and thought suppression in both alcohol-dependents and light drinkers using implicit and explicit measures. The hypotheses were as follows:

- 1) Relative to controls, the alcohol-dependent group would report higher thought suppression on the White Bear Suppression Inventory measures.
- 2) Relative to controls, the alcohol-dependent group would show a vigilance-avoidance pattern of attentional bias on the VPT, with vigilance for alcohol cues at 50ms and avoidance at 500ms, consistent with previous findings.
- 3) If a vigilance-avoidance pattern was found, thought suppression would partially mediate the group differences in attentional avoidance for alcohol cues presented for 500ms.

Method

Design

A cross-sectional between-groups design and correlation design comparing a clinical group of people who are alcohol dependent with a non-clinical group of light drinkers was employed.

Participants

Alcohol-dependent group. Sixty-four alcohol-dependent adults (30 male, 34 female; $M = 42.95$ years, $SD = 8.82$) undergoing inpatient detoxification were recruited from a specialist addiction clinic in the north west of England. All were clinically assessed as alcohol-dependent prior to detoxification. Treatment consisted of medication, psycho-education, holistic therapies and nursing care.

Non-dependent control group. Fifty-two current light drinkers (16 males, 36 females; $M = 39.76$ years, $SD = 12.80$) were recruited from businesses and sports venues around the north west of England. Light drinking was defined as a weekly consumption of 10.5 units or less per week for males and 7 units or less for females. The criterion is half the weekly consumption recommended by the British Medical Association (1995). Participants

were eligible if they had drunk at least one unit in the last month and never received treatment for an alcohol problem.

Exclusion criteria for both groups included acute or severe mental illness and/or cognitive impairment. Participants were required to be fluent in English and have normal or corrected-to-normal vision. Participants from the alcohol-dependent group were breathalysed. Participants were excluded if they had a positive breath alcohol level. The control group were asked to abstain on the day of study. The study received approval from the University of Liverpool, an NHS Research Ethics Committee and NHS Research Governance.

Measures

The Alcohol Use Disorders Identification Test (AUDIT; Babor et al., 2001). The AUDIT is a ten-item self-report questionnaire developed to ascertain whether a person's alcohol consumption is at a harmful level. Scores of 8 or more in males and 7 or more in women indicate harmful drinking whereas a score of 20 or more indicates alcohol dependence. One light drinker had a score of 10; however, they were still included in the study as their reported weekly alcohol consumption did not exceed half the government recommended amount. The AUDIT has been found to have good internal reliability and test-retest reliability (Meneses-Gaya et al., 2009). In the present study, internal consistency was found to be good ($\alpha = .95$).

The Approach and Avoidance of Alcohol Questionnaire - Right Now (AAAQ-Right Now; McEvoy et al., 2004). The AAAQ – Right Now is a 14-item self-report questionnaire which assesses inclinations to approach and avoid drinking alcohol. Respondents are asked how strongly they agree with each item on a 9-point Likert scale ranging from 0 (not at all) to 8 (very strongly). It consists of three subscales: ‘inclined/indulgent’ which captures mild approach tendencies, ‘obsessed/compelled’ which captures intense approach tendencies, and ‘resolved/regulated’ which captures avoidance

tendencies. The subscales have been shown to have high internal consistency (McEvoy et al., 2004). In the present study, Cronbach's alpha for the inclined/indulgent and obsessed/compelled subscales were acceptable ($\alpha = .74$ and $.77$ respectively). The resolved/regulated subscale had good internal consistency ($\alpha = .90$).

The White Bear Suppression Inventory (WBSI; Wegner & Zanakos, 1994). The WBSI is a 15-item questionnaire designed to measure thought suppression. Respondents are asked how strongly they agree with each item on a 5-point Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree). Higher scores indicate high levels of thought suppression. The WBSI has been found to have satisfactory psychometric stability; however, more recently evidence suggests it has a two-factor structure ('suppression' and 'intrusive thoughts' dimensions) as opposed to a one-factor structure (Schmidt et al., 2009). Nevertheless, it was still considered suitable for this study and Cronbach's alpha was $.93$.

The White Bear Suppression Inventory – adapted version. For the purpose of this study, an adapted version of the WBSI was used to assess thought suppression in relation to thoughts about alcohol (see appendix F). The six highest correlating items from the original WBSI were taken and the wording slightly altered so that the question was answered in relation to thoughts about alcohol. For example, 'I have thoughts that I try to avoid' was changed to 'I have thoughts about drinking that I try to avoid'. Internal consistency was found to be good ($\alpha = .95$).

Timeline Follow Back (TFLB; Sobell & Sobell, 1992). The TFLB was completed by the control group only. It assessed participants' alcohol consumption in units during the fortnight prior to completing the study. All the above measures can be found in Appendix F.

Visual Probe Task. A VPT (based on the one used in Field et al., 2013) was used to measure attentional bias for alcohol-related and neutral stimuli. Participants were sat in front of a laptop and asked to fixate on a white cross in the centre of the screen at the start of each

trial. This was then replaced by a pair of pictures. The pairs consisted of alcohol and neutral pictures and neutral pictures paired with neutral pictures (neutral-neutral trials). Neutral-neutral trials were used to check whether any attentional bias reflected quick orienting or slow disengagement (Koster et al., 2004). Picture pairs were displayed for 50ms or 500ms. Following this a visual probe (white dot) appeared on the screen replacing one of the pictures. Participants were asked to respond to the probe as quickly as possible by pressing the appropriate button on the keyboard. Reaction times (RTs) were recorded. There were 176 trials in the main block comprising 16 neutral-neutral trials, 36 congruent trials (probe replaces an alcohol picture) and 36 incongruent trials (probe replaces a neutral picture); 88 for each stimulus onset asynchrony (SOA; 50ms, 500ms). Attentional bias was calculated by subtracting RTs to alcohol congruent trials from RTs to alcohol incongruent trials. Positive scores indicated attentional bias for alcohol-related pictures. This tool has been shown to be capable of measuring attentional bias in heavy social drinkers (Townshend & Duka, 2001; Field et al., 2004) and is a common tool in addiction research (Lubman et al., 2000; Ehrman et al., 2002; Bradley et al., 2003).

Procedure

Eligible participants (alcohol-dependent group) were approached by staff a minimum of four days after admission or when withdrawal symptoms had subsided and given a participant information sheet. If interested, staff would forward their details to the researcher who would make contact to discuss the study, answer questions and arrange a time to meet. The control group were invited to take part via posters and staff /membership email updates. If interested, participants contacted the researcher directly. At this point the participant information sheet would be emailed to them after which they could contact the researcher to discuss or arrange a time to complete the study. Participant information sheets were given a minimum of 24 hours prior to taking part in the study. All participants were tested in a quiet

room at the clinic (patients) or at their workplace/home (controls). The researcher was present throughout. Participants were free to withdraw from the study at any point.

After a brief introduction to the study participants completed a consent form. The VPT was administered first. Verbal instructions were given in addition to on-screen instructions. Participants completed practice trials (no alcohol cues) before commencing the main trials. Following the VPT participants completed the questionnaires and demographic details were taken. The light drinker control group completed the TLFB and information about the alcohol-dependent participants' alcohol consumption was taken from their paper files (screening assessment or referral letter). Finally, all participants were debriefed. This involved checking whether participants were in any distress, whether the study had induced any cravings and to answer questions about the study. None of the participants reported any distress following the study. Participants were given the option to be contacted with the results of the study and were compensated for their time with a £5 gift voucher.

Data Analysis

Data analysis was conducted using SPSS statistical software. For the VPT, outliers (identified by a box-plot) were excluded and data were discarded if participants made 20% or more errors (pressing the wrong button). This resulted in the loss of data from four alcohol-dependent group participants and one control (4.3%). Attentional bias scores were calculated for each SOA (50ms, 500ms) by subtracting mean RTs on congruent trials (probe replaces an alcohol picture) from mean RTs on incongruent tasks (probe replaces a neutral picture). A positive score reflects attentional bias for alcohol-related pictures.

To test hypothesis 1, WBSI and WBSI – adapted version scores for both groups were compared using independent t-tests. To test hypothesis 2, a mixed 2 x 2 x 3 analysis of variance (ANOVA) with group as the between-subjects factor (alcohol-dependent, light drinker), and type of trial (alcohol congruent, alcohol incongruent, neutral) and the SOA

(50ms. 500ms) as the within-subjects factors was conducted. A mediation analysis was planned to test hypothesis 3 if hypothesis 2 was supported.

When parametric assumptions were not met, non-parametric tests and bootstrapping were used; however, the results showed similar effects therefore parametric data was reported. Details of data screening can be found in Appendix H. A power analysis was conducted prior to commencing the study to determine the sample size necessary to detect an effect (see Appendix G). Due to the sample size recruited it is assumed the study had reasonable power.

Results

Group Characteristics

Groups did not differ significantly in age, $t(85.95) = 1.50, p = .135$, or in gender $\chi^2(1) = 3.11, p = .089$. The groups differed significantly on employment status ($\chi^2(3) = 75.21, p < .001$), accommodation status ($\chi^2(4) = 56.54, p < .001$), marital status ($\chi^2(4) = 33.23, p < .001$) and smoking status ($\chi^2(1) = 61.50, p < .001$). The control group were more likely to be employed, home owners and married whereas the alcohol-dependent group were more likely to be smokers, unemployed, single and renting.

Table 1 shows summary data for the alcohol-dependent and control groups on the questionnaires. As predicted (Hypothesis 1), the alcohol-dependent group scored higher on the WBSI questionnaires, indicating higher levels of suppression. Groups differed significantly on the Resolved/Regulated and Obsessed/Compelled subscales of the AAAQ; the alcohol-dependent group had higher scores on these subscales indicating intense approach and avoidance motivation.

Table 1

Questionnaire Summary Data for Alcohol-dependent and Control Group.

		Alcohol-dependent		Light Drinker Control		<i>t</i> (115)	<i>p</i>
		Mean	SD	Mean	SD		
AUDIT		34.97	3.74	3.71	2.01	57.14	.000
WBSI		59.16	9.58	41.42	11.937	8.68	.000
WBSI-adapted		22.72	5.02	7.31	2.81	20.86	.000
AAAQ	Inclined/Indulgent	1.76	1.95	2.22	1.52	-1.44	.152
	Resolved/Regulated	6.00	1.74	.80	1.09	19.64	.000
	Obsessed/Compelled	2.71	2.04	.11	.38	10.02	.000

Visual Probe Task

To test our second hypothesis a 2 x 2 x 3 mixed ANOVA was performed with group (alcohol-dependent vs light drinker control) as the between-subjects factor and trial type (alcohol congruent, alcohol incongruent and neutral) and SOA (50ms and 500ms) as within-subject factors. There were significant main effects for group, $F(1,108) = 5.86, p < .05$, indicating that the alcohol-dependent group had slower RTs than the light drinkers. There was also a main effect for trial type $F(2, 216) = 23.90, p < .05$, indicating that regardless of group participants responded quicker on the neutral-neutral trials, and SOA, $F(1,108) = 249.44, p < .05$, indicating that participants responded quicker when the pictures were shown for 500ms (see Figures 3 and 4). No significant interactions were found (all $ps > .05$). This suggests that attentional bias between the alcohol-dependent and controls did not differ significantly; therefore, hypothesis 2 was not supported. Consequently we did not test hypothesis 3.

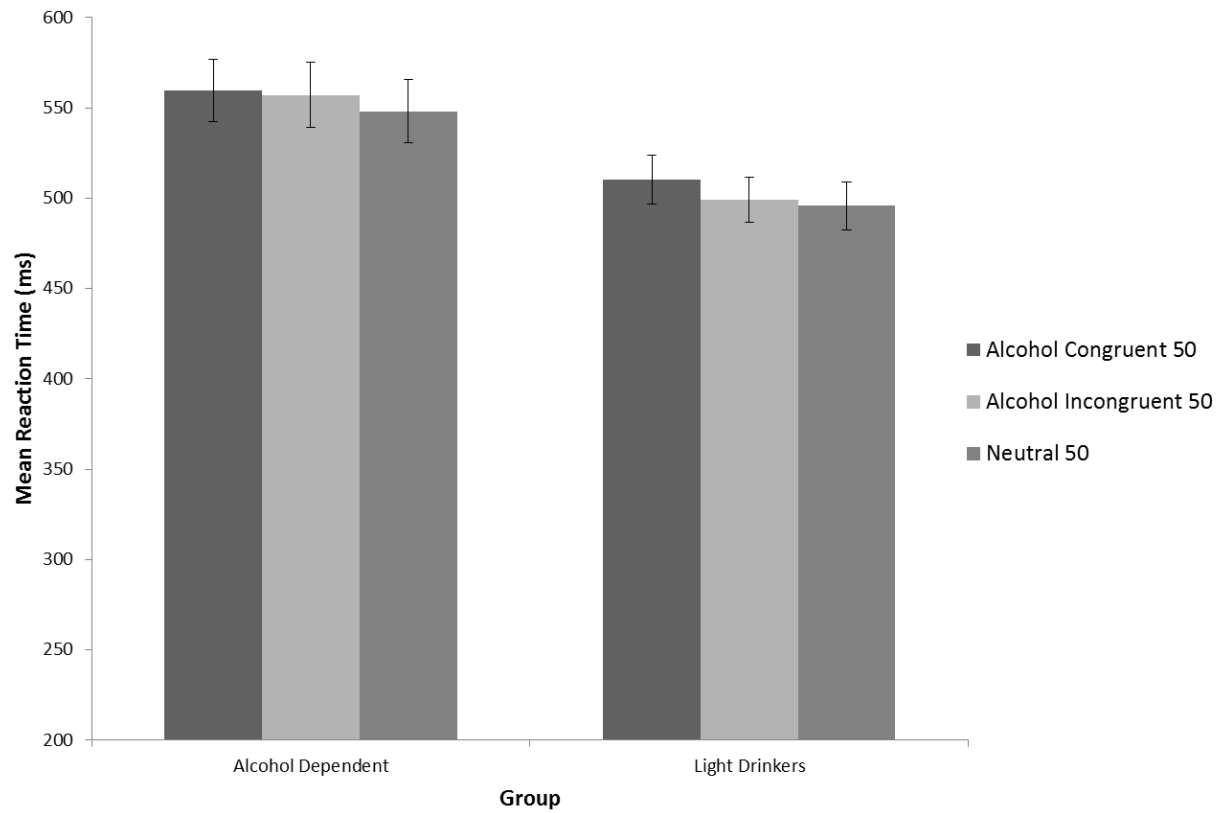


Figure 3. A bar chart to show mean RTs to the three trial types of the VPT 50ms by group

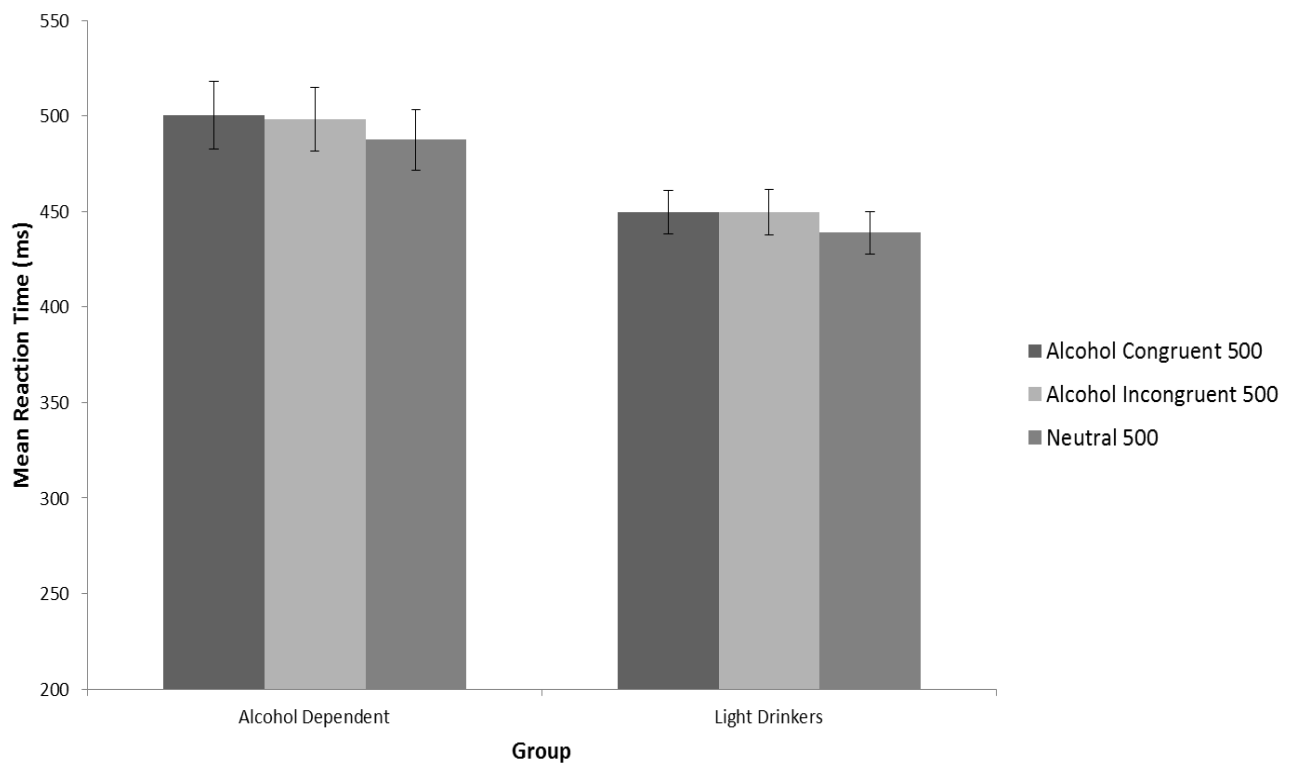


Figure 4. A bar chart to show mean RTs to the three trial types of the VPT 500ms by group

Correlations

Pearson correlations (one-tailed) were used to assess the relationship between the self-report measures and attentional bias scores in the alcohol-dependent group. One-tailed p values are reported due to the nature of the hypotheses; however, it was noted that two-tailed r and p values showed similar effects. Bias corrected and accelerated bootstrap (BCa) 95% CIs are reported in square brackets. The WBSI was significantly correlated with the Obsessed/Compelled subscale, $r = .33$ [.088, .513] and the Resolved/Regulated subscale, $r = .45$ [.236, .631], (all $ps < .01$). Attentional bias scores (50ms) were weakly correlated with the Obsessed/Compelled subscale, $r = .246$ [.047, .404], $p = .030$ and attentional bias scores (500ms) were weakly negatively correlated with Resolved/Regulated subscale, $r = -.275$ [-.469, -.075], $p = .017$. There were no other significant correlations (all $ps > .05$).

Discussion

The aims of the study were to investigate approach and avoidance tendencies and thought suppression using a VPT and questionnaires with alcohol-dependent patients and controls. As predicted the alcohol-dependent group reported significantly higher levels of thoughts suppression relative to light drinkers. Similar to previous findings the alcohol-dependent group scored significantly higher on the ‘obsessed/compelled’ and ‘resolved/regulated’ AAAQ subscales, indicating intense approach and avoidance tendencies. Despite demonstrating high avoidance tendencies on the AAAQ the alcohol-dependent group did not show an attentional avoidance for alcohol cues presented for 500ms relative to controls.

The results echo previous studies using similar methods. Field et al. (2013) and Vollstädt-Klein et al. (2009) failed to detect significant differences between alcohol-dependent patients and social drinkers on attentional avoidance. Loeber et al. (2009) found similar results but did not include a control group. These results contrast with other studies

which suggest that alcohol-dependent individuals post-treatment do show an attentional avoidance for alcohol cues presented for 500ms (Stormark et al., 1997; Noel et al., 2006; Townshend & Duka, 2007). A possible reason for this might be length of abstinence. The evidence for attentional avoidance comes from alcohol-dependent patients who had been abstinent two weeks or more but not for those abstinent for less than two weeks. The patients in this study were in the early stages of recovery, some as little as four days.

Previous attentional bias studies with heavy social drinkers have found that level of stress, intoxication and opportunities to drink can have an effect (Field & Powell, 2007; Field et al., 2011). In this study patients were all tested within a treatment clinic where withdrawal symptoms were managed and there were no opportunities to consume alcohol (no expectation of substance availability) which might have affected the results.

Similar to other studies, this study showed a discrepancy between implicit and explicit motivation tendencies. Barkby et al. (2012) found that alcohol cues did not elicit an automatic avoidance response during a stimulus-response task amongst alcohol-dependent inpatients, despite them reporting high levels of avoidance tendencies on self-report measures. Dickson et al. (2013) found a discrepancy between controlled (explicit) and automatic (implicit) processes; further evidence that this might be characteristic of alcohol dependence.

Limitations

There were several limitations in this study. As previously mentioned, evidence suggests that the WBSI measures two separate concepts; thought suppression and thought intrusion. Alternative measures have been suggested (Rassin, 2003) that might measure thought suppression more accurately. Despite this, the WBSI remains a popular measure of thought suppression. The adapted version used in this study is not a validated measure; however, its results were examined tentatively.

Attentional avoidance was measured using the VPT. The VPT was used in favour of the Stroop test as it allows manipulation of duration of alcohol stimuli to distinguish between initial orienting and maintenance of attention. Whilst The VPT is considered a better measure of attentional bias than the Stroop test, it is not without its criticisms, especially in the field of addiction. A systemic review by Ataya et al. (2012) criticised the VPT for its poor internal reliability. Also of note is, in the current study despite being told to fixate on the cross at the beginning of each trial, many participants in both groups reported using the technique of focusing on one side of the screen only. It is unclear what effect this might have had. This was a cross-sectional study and therefore we cannot infer any causal relationship between motivational tendencies, attentional bias, thought suppression and alcohol use.

Clinical Implications

The results of this study suggest that thought suppression is a strategy employed by alcohol-dependent adults undergoing treatment. These findings have implications for the assessment and treatment of alcohol dependence. This research highlights the importance of identifying the strategies that people use whilst trying to abstain and educating people about their unhelpful effects. Mindfulness-based approaches which encourage acceptance of thoughts could prove useful (Kabat-Zinn, 1990). Given its paradoxical effect, further research is needed to investigate the role of thought suppression within alcohol dependence. Furthermore, there was a discrepancy between explicit and implicit processes, consistent with other studies, which require further investigation to determine its clinical significance.

Future Research

Future studies could investigate implicit and explicit motivational tendencies in alcohol-dependent individuals during different stages of treatment (for example pre-treatment, post-treatment and follow up) to see whether this has an impact. If avoidance

motivation was found for alcohol cues presented for longer durations (e.g. 500ms) it might be worthwhile conducting an analysis into the possible mediating effect of thought suppression.

A measure of thought suppression specific to smoking has been developed (Nosen & Woody, 2012). A validated measure which looks at thought suppression related to alcohol thoughts (such as the one this study attempted to create) would be useful both in future research and in clinical settings.

Conclusions

To conclude, this was the first study to investigate implicit and explicit processes of approach and avoidance motivation, attentional bias and thought suppression, in a group of alcohol-dependent individuals and controls. The study found that alcohol-dependent individuals undergoing treatment report using thought suppression in their attempts to avoid alcohol-related thoughts. This study did not find a group difference in attentional avoidance which has been found in some studies and not in others, further confirmation that the findings in this area are mixed. Possible reasons for this might be due to individual and environmental factors which should be explored further in future research.

References

- Ataya, A. F., Adams, S., Mullings, E., Cooper, R. M., Attwood, A. S., & Munafo, M. R. (2012) Internal reliability of measures of substance-related cognitive bias. *Drug Alcohol Depen*, **121**, 148-151.
- Babor, T. F., Higgins-Biddle, J. C., Saunders, J. B., & Monteiro, M. G. (2001) *The alcohol use disorders identification test: Guidelines for use in primary care (2nd ed)*. Geneva, Switzerland: World Health Organisation.
- Barkby, H., Dickson, J. M., Roper, L., Field, M. (2012) To approach or avoid alcohol? Automatic and self-reported motivational tendencies in alcohol-dependence. *Alcohol Clin Exp Res*, **36**, 361-368.
- Bradley, B. P., Mogg, K., Wright, T., & Field, M. (2003) Attentional bias in drug dependence: Vigilance for cigarette-related cues in smokers. *Psychol Addict Behav*, **17**, 66-72.
- Breiner, M. J., Stritzke, W. G. K., & Lang, A. R. (1999) Approaching avoidance: A step essential to the understanding of craving. *Alcohol Res Health*, **23**, 197-206.
- British Medical Association (1995) *Alcohol: guidelines on sensible drinking*. London: British Medical Association.
- Dickson, J., Gately, C., Field, M. (2013) Alcohol dependent patients have weak negative rather than strong positive implicit alcohol associations. *Psychopharmacology* **228**, 603-610.
- Ehrman, R. N., Robbins, S. J., Bromwell, M. A., Lankford, M. E., Monterosso, J. R., & O'Brien, C. P. (2002) Comparing attentional bias to smoking cues in current smokers, former smokers, and non-smokers using a dot-probe task. *Drug Alcohol Depen*, **67**, 185–191.

- Field, M., Caren, R., Fernie, G., & De Houwer, J. (2011) Alcohol approach tendencies in heavy drinkers: Comparison of effects in a relevant stimulus-response compatibility task and an approach/avoidance task. *Psychol Addict Behav*, **25**, 697- 701.
- Field, M., & Cox, W.M. (2008) Attentional bias in addictive behaviors: a review of its development, causes, and consequences. *Drug Alcohol Depen.* **97**, 1-20.
- Field, M., Mogg, K., Mann, B., Bennett, G.A., Bradley, B.P. (2013) Attentional biases in abstinent alcoholics and their association with craving. *Psychol Addict Behav*, **27**(1), 71-80.
- Field, M., Mogg, K., Zetteler, J., & Bradley, B. P. (2004) Attentional biases for alcohol cues in heavy and light social drinkers: the roles of initial orienting and maintained attention. *Psychopharmacology*, **176**, 88-93.
- Field, M., Munafo, M. R., & Franken, I. H. A. (2009) A meta-analytic investigation of the relationship between attentional bias and subjective craving in substance abuse. *Psychol Bull*, **135**, 589-607.
- Field, M., & Powell, H. (2007) Stress increases attentional bias for alcohol cues in social drinkers who drink to cope. *Alcohol Alcoholism*, **42**, 560-566.
- Franken, I. H. A. (2003) Drug craving and addiction: integrating psychological and neuropsychopharmacological approaches. *Prog Neuro-Psychoph*, **27**, 563-579.
- Jones, B. T, Corbin, W., & Fromme, K. (2001) A review of expectancy theory and alcohol consumption. *Addiction* **96**, 57–72.
- Kabat-Zinn, J. (1990) *Full Catastrophe Living: Using the Wisdom of your Mind to Face Stress, Pain and Illness*. New York: Dell Publishing.
- Klein, A. A. (2007) Suppression-induced hyperaccessibility of thoughts in abstinent alcoholics: A preliminary investigation. *Behav Res Ther*, **45**, 169-177.

- Koster, E.H.W., Crombez, G., Verschuere, B., & de Houwer, J. (2004) Selective attention to threat in the dot probe paradigm: differentiating vigilance and difficulty to disengage. *Behav Res Ther*, **42**(10), 1183-1192.
- Loeber, S., Vollstadt-Klein, S., Von Der Goltz, C., Flor, H., Mann, K., & Kiefer, F. (2009) Attentional bias in alcohol-dependent patients: The role of chronicity and executive functioning. *Addict Biol*, **14**, 197-203.
- Lubman, D. I., Peters, L. A., Mogg, K., Bradley, B. P. and Deakin, J. F. W. (2000) Attentional bias for drug cues in opiate dependence. *Psychol Med*, **30**, 169–175.
- McEvoy, P. M., Stritzke, W. G. K., French, D. J., Lang, A. R., Ketterman, R. L. (2004) Comparison of three models of alcohol craving in young adults: a cross-validation. *Addiction*, **99**, 482-497.
- Meneses-Gaya, C. D., Zuardi, A. W., Loureiro, S.R., Crippa, J. A. S. (2009) Alcohol use disorders test (AUDIT): An updated systematic review of psychometric properties. *Psychol Neuroscience*, **2**, 83-97.
- Noel, X., Colmant, M., Van Der Linden, M., Bechara, A., Bullens, Q., Hanak, C., & Verbanck, P. (2006) Time course of attention for alcohol cues in abstinent alcoholic patients: the role of initial orienting. *Alcohol Clin Exp Res*, **30**, 1871-1877.
- Nosen, E., & Woody, S. R. (2012) Development and initial validation of the white bear suppression inventory (smoking version). *Nicotine Tob Res*, **15**(6), 1155-1160.
- Palfai, T. P., Monti, P. M., Colby, S. M., & Rohsenow, D. J. (1997) Effects of suppressing the urge to drink on the accessibility of alcohol outcome expectancies. *Behav Res Ther*, **35**, 59-65.
- Rassin, E. (2003) The white bear suppression inventory (WBSI) focuses on failing suppression attempts. *Eur J Personality*, **17**(4), 285-298.

- Robinson, T. E., Berridge, K. C. (1993) The neural basis of drug craving: an incentive-sensitization theory of addiction. *Brain Res Rev*, **18**, 247-291.
- Schmidt, R. E., Gay, P., Courvoisier, D. et al. (2009) Anatomy of the white bear suppression inventory (WBSI): A review of previous findings and a new approach. *J Pers Assess*, **91**(4), 323-328.
- Sobell, L. C., & Sobell, M. B. (1992) Timeline follow-back: A technique for assessing self-reported alcohol consumption. In R. Z. Litten, & J. Allen (eds.) *Measuring alcohol consumption: Psychosocial and biological methods* (pp. 41–72). New Jersey: Humana Press.
- Stormark, K. M., Field, N.P., Hugdahl, K., & Horowitz, M. (1997) Selective processing of visual alcohol cues in abstinent alcoholics: an approach-avoidance conflict? *Addict Behav*, **22**, 509-19.
- Townshend, J. M., & Duka, T. (2001) Attentional bias associated with alcohol cues: Differences between heavy and occasional social drinkers. *Psychopharmacology*, **157**(1), 67–74.
- Townshend, J.M., Duka, T. (2007) Avoidance of alcohol-related stimuli in alcohol-dependent inpatients. *Alcohol Clin Exp Res*, **31**(8), 1349-1357.
- Vollstadt-Klein, S., Loeber, S., von der Goltz, C., Mann, K., Kiefer, F. (2009) Avoidance of alcohol-related stimuli increases during the early stage of abstinence in alcohol-dependent patients. *Alcohol Alcoholism*, **44**, 458–463.
- Wegner, D.M., & Erber, R. (1992) The hyperaccessibility of suppressed thoughts. *J Pers and Soc Psychol*, **63**, 903–12.
- Wegner, D. M., Schneider, D. J., Carter, S., & White, T. (1987) Paradoxical effects of thought suppression. *J Pers Soc Psychol*, **53**, 5-13.
- Wegner, D. M., & Zanakos, S. (1994) Chronic thought suppression. *J Pers*, **62**, 615-640.

Wiers, R.W., & Stacy, A.W. (eds). (2006) *Handbook of implicit cognition and addiction*. CA: SAGE Publishers.

Wenzlaff, R. M., & Wegner, D. M. (2000) Thought suppression. *Annu Rev Psychol*, **51**, 59-91.

Appendices

Appendix A:
**Author guidelines for Alcohol and
Alcoholism Journal**

Author guidelines for Alcohol and Alcoholism Journal

Editors, Advisors and Independent Referees

Normally a paper is read by the handling Editor and two other persons, who may be Editorial Advisors, independent referees or both. The main task of the advisors and referees is to make recommendations on the acceptability of a paper. If rejection of a paper is recommended, or if there is any serious disagreement between those who have read the paper, the final decision is made by the Editor or Editors. Normally each paper is handled throughout by an Editor who will, if the paper is acceptable, make amendments and will request revision or shortening. Once the Editor(s) is satisfied, the paper is then prepared for press by an in-house sub-editor. In this final process, attention is paid to grammar and the detailed conventions of the Journal.

Submission of papers

The Chief Editors may decide to make a repaid refusal if a submission does not meet minimum criteria of scientific rigour, and relevance and interest to the Journal's readers. Submission of a paper implies that it has been approved by all the named authors, and that it reports unpublished work, that it is not under consideration for publication in whole or in part elsewhere, and that if accepted by *Alcohol and Alcoholism* it will not be published elsewhere in the same form, either in English or in any other language, without the consent of the Editors.

Papers that are scientifically acceptable but need revision because they are not clear and concise or do not conform sufficiently to the conventions of *Alcohol and Alcoholism* will be returned to the authors for amendment.

Conflicts of Interest

At the point of submission, Alcohol and Alcoholism's policy requires that each author reveal any financial interests or connections, direct or indirect, or other situations that might raise the question of bias in the work reported or the conclusions, implications, or opinions stated - including pertinent commercial or other sources of funding for the individual author(s) or for the associated department(s) or organization(s), personal relationships, or direct academic competition. When considering whether you should declare a conflicting interest or connection please consider the conflict of interest test: Is there any arrangement that would embarrass you or any of your co-authors if it was to emerge after publication and you had not declared it?

As an integral part of the online submission process, Corresponding authors are required to confirm whether they or their co-authors have any conflicts of interest to declare, and to provide details of these. If the Corresponding author is unable to confirm this information on behalf of all co-authors, the authors in question will then be required to submit a completed Conflict of Interest form to the Editorial Office. It is the Corresponding author's responsibility to ensure that all authors adhere to this policy.

If the manuscript is published, Conflict of Interest information will be communicated in a statement in the published paper.

Reprints and permissions

All communications about reprints should be addressed to the Publisher: Oxford University Press, Great Clarendon Street, Oxford OX2 6DP, UK. Authors will receive a URL linking them to a press ready PDF version of their published work, free of charge. Additional printed copies can be purchased by using the Oxford Journals Author Services site. Requests for consent for reproduction of material from the Journal should be addressed to the Publisher.

Quotations of personal communications

When such a quotation is made the authors should provide written evidence of permission from the person(s) concerned to be quoted. Such reference to personal communications should be made only in the text, not in the list of references.

Consent for publication

When a typescript is submitted please send a letter to the Chief Editor signed by all the authors giving consent for publication in the Journal including the following statement: 'This paper has not been, nor will be, published in whole or in part by any other journal'. The senior author may, for reasons of convenience, submit a written and signed authorization by another co-author(s) for him(her) to sign on his(her) behalf, if such a co-author(s) is likely to be absent during the week of submission. In submitting illustrations or photographs, only one original is required, four photocopies should be enclosed with the four copies of the paper. The original manuscript and figures will be discarded one month after publication unless the Publisher is requested to return original material to the author(s).

Title page

The title of the paper should be given in full, together with the name(s) of the author(s), address(es) of the Laboratory or Unit(s) in which the work was performed, the address, telephone, fax and e-mail numbers of the author to whom correspondence concerning the handling of the paper should be sent. A running title for the paper and a list of no more than six key words should also be provided. A copy of the journal should be consulted for the journal style.

Abstract

An Abstract of between 3 and 5% of the total length of the paper (60 words for Rapid Communications) should precede the text. The Abstract must include a brief summary of the work done and the conclusions reached. It must not include any introductory material nor description of methods used or statistical comparisons of results. The Abstract should be structured into the following sections: Aims, Methods, Results and Conclusions.

Style of papers

Typing should be on one side of white paper of uniform size, no smaller than quarto, double-spaced and with wide margins on either side of the typed text.

Spelling should conform to that of the *Oxford English Dictionary*. Full stops are not allowed in contractions or abbreviations; ATP, 11 g/dl, etc.

Language Editing

Particularly if English is not your first language, before submitting your manuscript you may wish to have it edited for language. This is not a mandatory step, but may help to ensure that the academic content of your paper is fully understood by journal editors and reviewers.

Language editing does not guarantee that your manuscript will be accepted for publication. If you would like information about one such service please [click here](#). There are other specialist language editing companies that offer similar services and you can also use any of these. Authors are liable for all costs associated with such services.

Tables

Each Table should be typed on a separate sheet and should be supplied with a heading and an explanatory legend. The heading and legend should make the general meaning comprehensible without reference to the text. The heading, which should precede the Table details, must be short but informative, and must not include any details of any kind.

Conditions specific to the particular experiment should be stated in the legend, which should be placed at the bottom of the Table. Reference to the text for general experimental methods is permissible provided that there is no ambiguity. Footnotes should be as few as possible.

The units in which the results are expressed, e.g. g/dl, should be given at the top of each column, and not repeated on each line of the Table. Words or numerals should be repeated on successive lines; 'ditto' or " are not to be used. The approximate positions of the Tables should be indicated in the text.

Illustrations

Each illustration should be submitted electronically; each should bear the author's name, the title (abbreviated if necessary) of the paper and the Figure number. All photographs, diagrams and charts (both line and half-tone) should be referred to as Figures, given Arabic numerals numbered consecutively in the order in which they are referred to in the text. The approximate position of each Figure in the text should be indicated in the text.

Figure legends must be typed on a separate sheet at the end of the paper. Each Figure should be supplied with a heading and legend which should make the general meaning comprehensible without reference to the text. The heading must be short but informative and must not contain any details of any kind nor be merged with the legend. The legend should then be started on a separate line and should include details specific to the particular experiment. Reference to the text for general experimental details is permissible provided that there is no ambiguity.

Figures should be provided as jpg or tif files (publication quality min 300 d.p.i. at final print size).

Reproduction of half-tone illustrations (photographs)

The magnification, if any, is to be indicated; this is best done by adding a bar representing a stated length. The Editors will accept plates for publication only (a) when they make a significantly important scientific or clinical contribution to the paper, and (b) when the photographs supplied are of a quality that justifies publication in this form. Illustrations are

usually reproduced in black and white. Authors wishing to submit colour illustrations will be asked to contribute towards the costs (350 GBP/600 USD per page)

Footnotes

These should be avoided as far as possible. When they must be used, as in Tables, reference should be made by the symbols *, **, ***, †, ††, †††, in that order.

Acknowledgements

These must be as short as possible.

Ethics of human experimentation

The Editors agree with the principles laid down in the Declaration of Helsinki (1964) [*British Medical Journal* (1964) **ii**, 177-178; see also the Report of the Medical Research Council for 1962-63, pp. 21-25]. Authors should ensure that their work complies with these declarations. Papers describing experimental work with humans should include a statement that the Ethics Committee of the Institution in which the work was performed has approved it, and should state that the subjects have given informed consent to the work. If necessary, the Editors may require to see a copy of the ethical approval.

Wider ethical guidelines

Alcohol and Alcoholism subscribes to the Farmington Consensus statement [see Alcohol and Alcoholism 33, 6-7 (1998)] and the Ethical Practice Guidelines of the International Society for Addiction Journal Editors (ISAJE), which can be accessed on the ISAJE website (<http://isaje.com>)

The ISAJE guidelines have been developed after consultation with recommendations and other documents produced by a variety of bodies, including those of the Committee on Publication Ethics (COPE), modification of the latter by *Drug and Alcohol Dependence*, the US National Institutes of Health (NIH), Office of Research Integrity, and the 'Integrity in Science' project of the Center for Science in the Public Interest (CSPI).

Conflict of Interest

This journal takes a serious view on various ethical issues related to publishing in this field. As well as familiarizing themselves with guidelines relating to these issues at the ISAJE website and elsewhere, authors should also pay special attention to issues related to 'conflict of interest' before submission of their work to this journal.

Authors should each declare to the Chief Editors any interests which could constitute a real, potential or apparent conflict of interest with respect to his/her involvement in the publication, between: (1) commercial entities and the participant personally; (2) commercial entities and the administrative unit with which the participant has an employment relationship. 'Commercial entity' refers to any company, business, industry, association (e.g. trade association), organization, or other unit with commercial interest.

Authors must declare to the Chief Editors any significant financial or other relations (e.g. directorship, consultancy or speaker fee) of him(her)self with companies, trade associations, unions or groups (including civic associations and public interest groups) that may gain or

lose financially from the results or conclusions in the study, review, commentary, editorial or Letter to the Editors.

All sources of funding for the study, review or other items should be declared in the typescript. Funding sources should be described in a way that allows the average reader to recognize any potential conflicts of interest.

Clinical trials

Authors reporting controlled treatment trials should follow the CONSORT guidelines, which can be accessed on the CONSORT website.

For cluster randomised trials (also called community based trials, place based trials, field trials), please follow the advice of Campbell, M. K. et al. (2004) CONSORT statement, in the *British Medical Journal* **328**, 702-708. *Extension to cluster randomised trials*.

Studies of Diagnostic Accuracy

Authors reporting studies of diagnostic accuracy should follow the checklist and flow diagrams recommended by the STARD initiative (Bossuyt et al., *British Medical Journal*, 2003; **326**, 41-44).

Experimental hazards

Authors should draw attention to any particular chemical or biological hazard that may be involved in carrying out the experiments described. Where appropriate, the safety precautions that were taken should be stated. Alternatively, a statement may be included to indicate that an acceptable code of practice has been followed, with references to the relevant standards.

SI units

Alcohol and Alcoholism uses the recommended SI symbols for units [see *Pure and Applied Chemistry* (1970) **21**, 1-44; *IUPAC Manual of Symbols and Terminology for Physico-chemical Quantities and Units* (1979) Pergamon Press, Oxford].

Other technical information

Details of technical data, e.g. chromatography, enzymes, isotope experiments, and other physical aspects and constants, mathematics and abbreviations of biochemicals are as published in the *Biochemical Journal* (1993) **289**, 1-15.

Statistics

The Editors emphasize the importance of correct statistical design, analysis and presentation. Authors are advised to consider all statistical aspects at the stage of planning the project, as badly designed studies may not be salvageable later. Statistical methods should be specified explicitly and referenced if they are non-standard. Estimates presented should be accompanied by indices of precision (e.g. means accompanied by confidence intervals). Authors are advised to consult the following: Altman, DG, Gore, SM, Gardner, MJ and Pocock, SJ. (1983) Statistical guidelines for contributors to medical journals. *British Medical Journal* **286**: 1489-93.

References

This is a modified Harvard style system. In the text, references for papers by more than two authors are given as the first author followed by *et al.* When more than one reference is mentioned at a time in the text, the references should be listed chronologically. In the list of references, the references should be typed double-spaced in alphabetical order and entries should be as follows:

(a) *Journal references*: (1) Authors' names; (2) year of publication; (3) title of paper; (4) abbreviated journal name; (5) volume number; (6) first and last page numbers. When there are more than seven authors, the first three authors are given, followed by *et al.*

Example: Badawy AA-B, Punjani NF, Evans M. (1981a) The role of liver tryptophan pyrrolase in the opposite effects of chronic administration and subsequent withdrawal of drugs of dependence, on rat brain tryptophan metabolism. *Am J Hum Genet* **196**: 171-80.

(b) *Book references*: (1) Authors' names; (2) year of publication; (3) title of article; (4) title of book and volume number, if any; (5) editor(s); (6) first and last page numbers of article; (7) city of publication; (8) publisher's name.

Example: Alkana RL and Noble EP. (1979) Amethystic agents - reversal of acute ethanol intoxication in humans. In Majchrowicz E and Noble EP (eds), *Biochemistry and Pharmacology of Ethanol*, Vol. 2, pp. 349-74. New York: Plenum Press.

Only papers published or accepted for publication (and therefore in press) can be included in the list of references. Personal communications, unpublished work or work submitted for publication should not be entered in the list of references, but can be quoted only in the text. Similarly, a paper presented at a conference cannot be considered as a publication and should not therefore be listed, unless it appeared as an Abstract in a Journal.

Drug and dosage selection

Authors must make every effort to ensure the accuracy of information, particularly with regard to drug selection and dose. However, appropriate information sources should be consulted, especially for new or unfamiliar drugs or procedures. It is the responsibility of every practitioner to evaluate the appropriateness of a particular opinion in the context of actual clinical situations and with due consideration to new developments.

Corrections to proofs

Authors are sent PDF page proofs by e-mail. Authors are fully responsible for corrections of any typographical errors. To avoid delays in publication, proofs should be checked immediately for typographical errors and returned by email or fax (+44 (0)1865 353798) to Oxford University Press.

Offprints

Authors will get a free URL link to their article online. Additional offprints can be ordered using the Oxford Journals Author Services site.

Copyright

Upon receipt of accepted manuscripts at Oxford Journals authors will be invited to complete an online copyright licence to publish form.

It is a condition of publication in *Alcohol and Alcoholism* that authors grant an exclusive licence to the Journal, published by Oxford University Press on behalf of the Medical Council on Alcohol. This ensures that requests from third parties to reproduce articles are handled efficiently and consistently and will also allow the article to be as widely disseminated as possible. In assigning the Licence, Authors may use their own material in other publications provided that the Journal is acknowledged as the original place of publication, and Oxford University Press is notified in writing and in advance. Upon receipt of accepted manuscripts at Oxford Journals authors will be invited to complete an online copyright licence to publish form.

Please note that by submitting an article for publication you confirm that you are the corresponding/submitting author and that Oxford University Press ("OUP") may retain your email address for the purpose of communicating with you about the article. You agree to notify OUP immediately if your details change. If your article is accepted for publication OUP will contact you using the email address you have used in the registration process. Please note that OUP does not retain copies of rejected articles.

Authorship

All persons designated as authors should qualify for authorship. The order of authorship should be a joint decision of the co-authors. Each author should have participated sufficiently in the work to take public responsibility for the content. Authorship credit should be based on substantial contribution to conception and design, execution, or analysis and interpretation of data. All authors should be involved in drafting the article or revising it critically for important intellectual content, and must have read and approved the final version of the manuscript. Assurance that all authors of the paper have fulfilled these criteria for authorship should be given in the covering letter.

OPEN ACCESS OPTION FOR AUTHORS

Alcohol and Alcoholism authors have the option to publish their paper under the Oxford Open initiative; whereby, for a charge, their paper will be made freely available online immediately upon publication. After your manuscript is accepted the corresponding author will be required to accept a mandatory licence to publish agreement. As part of the licensing process you will be asked to indicate whether or not you wish to pay for open access. If you do not select the open access option, your paper will be published with standard subscription-based access and you will not be charged. Upon publication. After your manuscript is accepted the corresponding author will be required to accept a mandatory licence to publish agreement. As part of the licensing process you will be asked to indicate whether or not you wish to pay for open access. If you do not select the open access option, your paper will be published with standard subscription-based access and you will not be charged.

FULL-LENGTH PAPERS

These should be written in the style described below, their length being the minimum required for precision in describing the experiments and clarity in interpreting them. A concise well-written paper tends to be published more rapidly. As guidance we recommend a maximum for original research papers 4000; Reviews may, exceptionally, extend to 5000 words. (These figures are exclusive of reference list and tables.)

To meet increased demand on pages because of continually rising submissions, and despite printing the journal in the larger (A4) format, the size of a full length paper is now restricted to six printed pages of the journal, or 5000 words in total, including space for Tables and Figures. The Editors, therefore, strongly urge authors to be concise and to submit their work to occupy the smallest possible space. The shorter the papers are, the more that could be accommodated in an issue and the quicker they could be published in this bi-monthly journal. Authors should ensure that no data are presented in both tabular and graphical forms and that the content of a small table could easily be described in the text, without loss of clarity, especially when there are many other Tables and/or Figures in the paper. Methods should not be described in detail if previously published and the 'Discussion' section should have the minimum of speculation and not be excessively long, ideally no longer than 1000 words.

Appendix B:

Ethical Considerations

Ethical Consideration

Study approval was granted from the Division of Clinical Psychology Research Review Committee and sponsorship was provided by the University of Liverpool. Due to the recruitment of NHS patients, permission was sought through the Integrated Research Application System (IRAS), which involved attending a Research Ethics Committee (REC) meeting, and the relevant trust's Research & Development team.

It was considered whether the study would present any risk to participants, for example increased craving through presenting alcohol-related pictures. Due to the nature of what was being tested, participants were not allowed to know beforehand that there would be alcohol-related stimuli. However, the duration of the pictures was felt to be no different from alcohol cues visible in the everyday environment, such as advertising.

Participants were given an Information Sheet (Appendix D) a minimum of 24 hours prior to the study. Participants were given the opportunity to ask questions before and after the study. The researcher remained with the participant throughout the study in case of any questions or difficulties. At the end of the study participants were debriefed. This consisted of asking them how they felt and whether they thought the study had impacted on them negatively. If so they would be asked whether they would like to talk to someone i.e. a nurse or in the case of the non-dependent group they could talk to any of the researchers. None of the participants reported any negative affect from participating in the study. Participants were free to withdraw from the study at any point and this would not affect their care or legal rights.

The alcohol-dependent participants were breathalysed prior to taking part in the study. This was to ensure a breath alcohol level (BAL) of zero so as not to impact on the results. A positive reading would have resulted in exclusion from the study and a member of staff on

the unit being informed. This was stipulated in the participant information sheet and on the consent form. None of the alcohol-dependent participants had a positive BAL.

Anonymity and confidentiality were ensured by allocating each participant with a number. Names appeared on the consent forms only which were stored separately from the questionnaires and computer-based task data. Consent forms and questionnaires were kept in a secure cabinet.

Appendix C:

Recruitment Advertisement

Light drinkers needed for alcohol study

I am seeking volunteers to take part in a study exploring people's feelings and attitudes towards alcohol. You will be asked to complete a computer-based task and answer several questionnaires about your thoughts and feelings about drinking alcohol. The study will take around 30 minutes in total. As a thank you for giving up your time you will be given **£5 high street gift voucher**.

To take part you must:

- Be aged between 21 and 65
- Have drunk at least one unit of alcohol in the last month
- Drink 7 units or less per week if you are female and 10.5 units or less per week if you are male
- Be fluent in English
- Have good eye sight or corrected-to-normal vision (i.e. wear glasses)
- Have never received treatment for an alcohol problem

If you are interested in taking part and would like more information please contact Michelle Taylor at Michelle.Taylor@liverpool.ac.uk or leave a message on 0151 794 5534. The study will take place at the University of Liverpool or a place convenient for you (e.g. your workplace).

What is a unit of alcohol?

- A pint of ordinary strength lager/ bitter/ cider - 2 units
- A 175ml glass of red or white wine - around 2 units
- A 750ml bottle of red or white wine – around 9 units
- A pub measure of spirits - 1 unit
- An alcopop - around 1.5 units

Appendix D:

Participant Information Sheets



PARTICIPANT INFORMATION SHEET

(Version 1 – 30/10/2012)

Contact details for the study:

Tel no. 0151 794 5534 for Michelle Taylor (Principal Investigator)

Tel no.0151 794 1124 for Prof. Matt Field (Chief Investigator)

Title of Study: An investigation into the relationship between thought suppression, implicit cognition and drinking behaviour.

You are being invited to take part in a research study. Before you decide, it is important that you understand what the study is about. Please take time to read the following information carefully and decide whether or not you wish to take part. You can discuss it with others if you wish. Please ask us if there is anything that is not clear or if you would like more information (see contact details at the end).

Why is this study being done?

People will often try to suppress thoughts about things they are trying to abstain from such as alcohol. Ironically, this can have the opposite effect and cause people to have more thoughts about the thing they are trying to avoid in the first place. People who are receiving treatment for alcohol problems often report using suppression to deal with intrusive thoughts about alcohol. If we can better understand this problem, we may be able to improve the support we give people during treatment.

Why have I been asked to take part?

This study is taking place at clinics across the North West which provide a service for people undergoing inpatient alcohol detoxification. We hope to involve 70 people who have undergone this treatment. You have been asked to take part because you are having/had this treatment.

Do I have to take part?

No. It is up to you to decide whether or not to take part. If you decide to take part, you will have time to ask questions about the study and go through this information sheet. This will be yours to keep. You will be asked to sign a consent form to show you have agreed to take part. If you take part, you are free to withdraw at any time during the study, without giving a reason. If you decide to withdraw, any information that can be identified as yours will be destroyed if you wish. A decision not to take part or to withdraw will not affect the standard of care you receive from the clinic.

What will I have to do if I take part?

If you choose to take part, we will first take a breathalyser sample from you. This is to check there is no alcohol in your system. You will then be asked to complete some simple tasks on a computer. This involves showing you pictures of alcoholic drinks and stationery. After this, you will be asked to complete some questionnaires. These ask about your thoughts and

feelings about drinking and how you feel emotionally. Altogether, this should take up to 45 minutes to complete. You will do this in a private room on the ward at the clinic. The researcher will be on hand if you have any questions. There will be time afterwards to talk with the researcher about taking part. In addition the researcher would look through your clinical at the clinic. This is because we need some basic background information about you and your recent drinking habits.

Payment

If you take part, you will be given £5 high street gift voucher. This is to thank you for giving up your time to take part and will be given after the testing session has finished.

What are the possible benefits of taking part?

This study is not designed to offer additional treatment so we cannot promise you will receive any direct benefit from taking part. However, the information we get from this study may help improve the treatment of future clients with alcohol dependency.

Are there any drawbacks of taking part?

Based on previous research, we do not expect completing the computer-based tasks to affect your craving for alcohol. We will check for this. We also do not expect any questions to make you feel upset or distressed. If you find any part of the study distressing, you can stop at any time. The researcher can discuss this with you or arrange for you to talk to your named nurse.

What if there is a problem?

We believe this study is safe and do not think there will be any problems. In the unlikely event that something does go wrong and you are harmed during this research, there are no special compensation arrangements. If you are harmed due to someone's negligence, you may have grounds for a legal action for compensation against the University of Liverpool and/or Mersey Care NHS Trust but you may have to pay your legal costs.

If you have a concern about any aspect of this study, please contact the researchers first. They will do their best to answer your questions. If you remain unhappy and wish to complain formally, you can do this through the normal National Health Service complaints procedure.

Will taking part in this study be kept confidential?

Yes. All information collected about you during the study will be kept strictly confidential. Any information you give will be de-identified so that you cannot be recognised from it without a 'code key' designed by the researchers. This key will be stored securely in a separate place to your data at the University of Liverpool that only the research team can access. Electronic and hard copies of data collected for this study will be stored securely at the University of Liverpool and will be destroyed 5 years after the end of the study. All electronic files will be password-protected. All procedures for handling and storing data will comply with the Data Protection Act 1998.

The only time when confidentiality would be broken is if you share information that suggests you or someone else may be at risk of imminent harm. If this happens, we will have a duty of care to disclose that information to a nurse on duty at the clinic or relevant outside agency. If the breathalyser sample shows you have alcohol in your system, we will have to tell a nurse

on duty. This is because it may not be safe to continue with the detoxification if there is alcohol in your system.

What will happen to the results of this research study?

The results will be written up and submitted in part fulfilment of an academic qualification and for publication in a scientific journal. You will not be identified in any report or publication. A copy of the research report will be available in the clinic. You will also be given the option to receive a summary of the results.

Who has approved the study?

The NHS Trust Research Ethics Committee, Mersey Care NHS Trust and Greater Manchester West NHS Foundation Trust Research and Development Department, and the DClinPsychol Research Review Committee have approved this study.

Contact for further information

If you require any further information or wish to discuss any aspects of this study, please contact me (Michelle Taylor) on 0151 794 5534 or the Chief Investigator (Dr Matt Field) on 0151 794 1124.

Thank you for taking the time to read this.

Researcher: Michelle Taylor (Trainee Clinical Psychologist)

Supervisors:

- **Prof. Matt Field** (Professor of Experimental Addiction Research, School of Psychology, University of Liverpool, Eleanor Rathbone Building, Bedford Street South, Liverpool, L69 7ZA) (**Chief Investigator**)
- **Dr. Joanne Dickson** (Lecturer/Research Director, Department of Mental Health and Well-Being, University of Liverpool, Whelan Building, Quadrangle, Brownlow Hill, Liverpool, L69 3GB)



PARTICIPANT INFORMATION SHEET

(Version 1 – 30/10/2012)

Contact details for the study:

Tel no. 0151 794 5534 for Michelle Taylor (Principal Investigator)

Tel no.0151 794 1124 for Prof. Matt Field (Chief Investigator)

Title of Study: An investigation into the relationship between thought suppression, implicit cognition and drinking behaviour.

You are being invited to take part in a research study. Before you decide, it is important that you understand what the study is about. Please take time to read the following information carefully and decide whether or not you wish to take part. You can discuss it with others if you wish. Please ask us if there is anything that is not clear or if you would like more information (see contact details at the end).

Why is this study being done?

People will often try to suppress thoughts about things they are trying to abstain from such as alcohol. Ironically, this can have the opposite effect and cause people to have more thoughts about the thing they are trying to avoid in the first place. People who are receiving treatment for alcohol problems often report using suppression to deal with intrusive thoughts about alcohol. This study aims to investigate the differences between alcohol-dependent people and light drinkers. If we can better understand this problem, we may be able to improve the support we give people during treatment.

Why have I been asked to take part?

The study is looking to recruit people who are alcohol-dependent and light drinkers. We hope to recruit 70 light drinkers. You have been approached because you are classed, by government standards, as a 'light drinker'.

Do I have to take part?

No. It is up to you to decide whether or not to take part. If you decide to take part, you will have time to ask questions about the study and go through this information sheet. This will be yours to keep. You will be asked to sign a consent form to show you have agreed to take part. If you take part, you are free to withdraw at any time during the study, without giving a reason. If you decide to withdraw, any information that can be identified as yours will be destroyed if you wish. A decision not to take part or to withdraw will not affect your rights.

What will I have to do if I take part?

If you choose to take part, we will first take a breathalyser sample from you. This is to check there is no alcohol in your system. You will then be asked to complete some simple tasks on a computer. This involves showing you pictures of alcoholic drinks and stationery. After this, you will be asked to complete some questionnaires. These ask about your thoughts and feelings about drinking and how you feel emotionally. Altogether, this should take up to 45 minutes to complete. You will do this in a private room on the ward at the clinic. The researcher will be on hand if you have any questions. There will be time afterwards to talk with the researcher about taking part.

Payment

If you take part, you will be given £5 high street gift voucher. This is to thank you for giving up your time to take part and will be given after the testing session has finished.

What are the possible benefits of taking part?

You will not receive any direct benefit from taking part. However, the information we get from this study may help improve the treatment of future clients with alcohol dependency.

Are there any drawbacks of taking part?

Based on previous research, we do not expect completing the computer-based tasks to affect your craving for alcohol. We will check for this. We also do not expect any questions to make you feel upset or distressed. If you find any part of the study distressing, you can stop at any time. The researcher can discuss this with you or arrange for you to talk to your named nurse.

What if there is a problem?

We believe this study is safe and do not think there will be any problems. In the unlikely event that something does go wrong and you are harmed during this research, there are no special compensation arrangements. If you are harmed due to someone's negligence, you may have grounds for a legal action for compensation against the University of Liverpool and/or Mersey Care NHS Trust but you may have to pay your legal costs.

If you have a concern about any aspect of this study, please contact the researchers first. They will do their best to answer your questions.

Will taking part in this study be kept confidential?

Yes. All information collected about you during the study will be kept strictly confidential. Any information you give will be de-identified so that you cannot be recognised from it without a 'code key' designed by the researchers. This key will be stored securely in a separate place to your data at the University of Liverpool that only the research team can access. Electronic and hard copies of data collected for this study will be stored securely at the University of Liverpool and will be destroyed 5 years after the end of the study. All electronic files will be password-protected. All procedures for handling and storing data will comply with the Data Protection Act 1998.

What will happen to the results of this research study?

The results will be written up and submitted in part fulfilment of an academic qualification and for publication in a scientific journal. You will not be identified in any report or publication. You will also be given the option to receive a summary of the results.

Who has approved the study?

The NHS Trust Research Ethics Committee, Mersey Care NHS Trust and Greater Manchester West NHS Foundation Trust Research and Development Department, and the DClinPsychol Research Review Committee have approved this study.

Contact for further information

If you require any further information or wish to discuss any aspects of this study, please contact me (Michelle Taylor) on 0151 794 5534 or the Chief Investigator (Prof. Matt Field) on 0151 794 1124.

Thank you for taking the time to read this.

Researcher: Michelle Taylor (Trainee Clinical Psychologist)

Supervisors:

- **Prof. Matt Field** (Professor of Experimental Addiction Research, School of Psychology, University of Liverpool, Eleanor Rathbone Building, Bedford Street South, Liverpool, L69 7ZA) (**Chief Investigator**)
- **Dr. Joanne Dickson** (Lecturer/Research Director, Department of Mental Health and Well-Being, University of Liverpool, Whelan Building, Quadrangle, Brownlow Hill, Liverpool, L69 3GB)

Appendix E:

Consent Forms



CONSENT FORM
(Version 1 – 30/10/2012)

Title of Study: An investigation into the relationship between thought suppression, implicit cognition and drinking behaviour

Name of Researcher: Michelle Taylor

Please initial box

1. I confirm that I have read and understand the information sheet dated 30/10/2012 (Version 1) for the above study and have been given the opportunity to ask questions. ☐
2. I understand that my participation is voluntary and that I am free to withdraw at any time without giving any reason, without my rights being affected. ☐
3. I agree to be breathalysed at the start of the study and understand the reason for this. I understand that if this indicates there is alcohol in my system, I cannot participate in the study. ☐
4. I agree to take part in the above study. ☐

Name of Participant

Date

Signature

Name of Researcher

Date

Signature



CONSENT FORM
(Version 1 – 30/10/2012)

Title of Study: An investigation into the relationship between thought suppression, implicit cognition and drinking behaviour

Name of Researcher: Michelle Taylor

**Please
initial box**

1. I confirm that I have read and understand the information sheet dated 30/10/2012 (Version 1) for the above study and have been given the opportunity to ask questions. ☐
2. I understand that my participation is voluntary and that I am free to withdraw at any time without giving any reason, without my medical care or legal rights being affected. ☐
3. I understand that sections of my clinical notes held at the Chapman-Barker unit may be looked at by the above researcher, where it is relevant to my taking part in this research. I give my permission for this individual to have access to my records. ☐
4. I understand that relevant sections of my care record and data collected during the study may be looked at by responsible individuals from the sponsor or host organisation or from regulatory authorities where it is relevant to taking part in this research. ☐
5. I agree to be breathalysed at the start of the study and understand the reason for this. I understand that if this indicates there is alcohol in my system, this information would have to be disclosed to a nurse on duty at the clinic. ☐
6. I agree to take part in the above study. ☐

Name of Participant

Date

Signature

Name of Researcher

Date

Signature

Appendix F:
Questionnaires – AUDIT, AAAQ, WBSI,
WBSI – adapted version and TLFB

AUDIT

1) How often do you have a drink containing alcohol?

Never Less than monthly 2-4 times a month 2-3 times per week 4+per week

2) How many drinks containing alcohol do you have on a typical day when you're drinking?

1-2 3-4 5-6 7-9 10+

3) How often do you have 6 or more drinks on one occasion?

Never Less than monthly Monthly Weekly Daily or almost daily

4) How often during the last year have you found that you were not able to stop drinking once you had started?

Never Less than monthly Monthly Weekly Daily or almost daily

5) How often during the last year have you failed to do what was normally expected from you because of drinking?

Never Less than monthly Monthly Weekly Daily or almost daily

6) How often during the last year have you needed a drink first thing in the morning to get yourself going after a heavy drinking session?

Never Less than monthly Monthly Weekly Daily or almost daily

7) How often during the last year have you had a feeling of guilt or remorse after drinking?

Never Less than monthly Monthly Weekly Daily or almost daily

8) How often during the last year have you been unable to remember what happened the night before because you had been drinking?

Never Less than monthly Monthly Weekly Daily or almost daily

9) Have you or someone else been injured because of your drinking?

No Yes, but not in the last year Yes, during the last year

10) Has a relative, friend, doctor or other health worker been concerned about your drinking or suggested you cut down?

No Yes, but not in the last year Yes, during the last year

This questionnaire relates to YOUR ATTITUDES toward alcohol RIGHT NOW. Please indicate how much you agree with the statements below by circling the number corresponding most closely to your general attitude RIGHT NOW. Your answers may range from AGREE NOT AT ALL (0) with the statement to AGREE VERY STRONGLY (8) with the statement.

		I AGREE WITH THIS STATEMENT									
		Not At All									Very Strongly
1.	I would like to have a drink or two.	0	1	2	3	4	5	6	7	8	
2.	I am avoiding people who are likely to offer me a drink.	0	1	2	3	4	5	6	7	8	
3.	If I were in a pub or club I would want a drink.	0	1	2	3	4	5	6	7	8	
4.	My desire to drink seems overwhelming.	0	1	2	3	4	5	6	7	8	
5.	I am planning to drink alcohol.	0	1	2	3	4	5	6	7	8	
6.	I am deliberately occupying myself so I will not drink alcohol.	0	1	2	3	4	5	6	7	8	
7.	I am thinking about the benefits of being sober.	0	1	2	3	4	5	6	7	8	
8.	I want to drink alcohol so much that if I start drinking now I will find it difficult to stop.	0	1	2	3	4	5	6	7	8	
9.	I would accept a drink now if one was offered to me.	0	1	2	3	4	5	6	7	8	
10.	I am avoiding places in which I might be tempted to drink alcohol.	0	1	2	3	4	5	6	7	8	
11.	I am thinking about alcohol a lot of the time.	0	1	2	3	4	5	6	7	8	
12.	I want to drink as soon as I have the chance.	0	1	2	3	4	5	6	7	8	
13.	The bad things that could happen if I drink alcohol are fresh in my mind.	0	1	2	3	4	5	6	7	8	
14.	If I were at a party now I would have a drink without thinking twice.	0	1	2	3	4	5	6	7	8	

Participant No _____

Date _____

WBSI

This is a survey about thoughts. There are no right or wrong answers, so please respond honestly to each of the items below. Be sure to answer every item by ticking the appropriate box beside each statement.

	Strongly Disagree	Disagree	Neutral or Don't know	Agree	Strongly Agree
1. There are things I prefer not to think about					
2. Sometimes I wonder why I have the thoughts I do					
3. I have thoughts that I cannot stop					
4. There are images that come to mind that I cannot erase					
5. My thoughts frequently return to one idea					
6. I wish I could stop thinking of certain things					
7. Sometimes my mind races so fast I wish I could stop it					
8. I always try to put problems out of mind					
9. There are thoughts that keep jumping into my head					
10. There are things that I try not to think about					
11. Sometimes I really wish I could stop thinking					
12. I often do things to					

distract myself from my thoughts					
13. I have thoughts that I try to avoid					
14. There are thoughts that I have that I don't tell anyone					
15. Sometimes I stay busy just to keep thoughts from intruding on my mind					
Total					

Participant No _____

Date _____

WBSI

This is a survey about thoughts about drinking alcohol. There are no right or wrong answers, so please respond honestly to each of the items below. Be sure to answer every item by ticking the appropriate box beside each statement.

	Strongly Disagree	Disagree	Neutral or Don't know	Agree	Strongly Agree
1. There are thoughts about drinking that I cannot stop					
2. There are images of drinking that come to mind that I cannot erase					
3. I wish I could stop thinking about drinking					
4. There are thoughts about drinking that keep jumping into my head					
5. There are things about my drinking that I try not to think about					
6. I have thoughts about drinking that I try to avoid					
Total					

Age:

Gender: M / F

Timeline Followback

To help me evaluate your drinking I need to get an idea of your alcohol consumption in the past fourteen days. Please fill out the table with the number of units of alcohol consumed on each day, being as accurate as possible. Please use the information given below to work out how many units you consumed on each day in the past week and fill in the number of units in the table. On days when you did not drink please write 0 (zero). I realise it isn't easy to recall things with 100% accuracy, but if you are not sure how many units you drank on a certain day please try to give it your best guess.

What is a unit of alcohol?

The list below shows the number of units of alcohol in common drinks:-

- A pint of ordinary strength lager (Carling Black Label, Fosters) - 2 units
- A pint of strong lager (Stella Artois, Kronenbourg 1664) - 3 units
- A pint of ordinary bitter (John Smith's, Boddingtons) - 2 units
- A pint of best bitter (Fuller's ESB, Young's Special) - 3 units
- A pint of ordinary strength cider (Woodpecker) - 2 units
- A pint of strong cider (Dry Blackthorn, Strongbow) - 3 units
- A 175ml glass of red or white wine - around 2 units
- A 750ml bottle of red or white wine – around 9 units
- A pub measure of spirits - 1 unit
- An alcopop (eg Smirnoff Ice, Bacardi Breezer, WKD, Reef) - around 1.5 units

Please now fill in the following table stating the total number of alcohol units you consumed for each day. Please start from whichever day it was yesterday and work backwards. For example if today is Monday start from Sunday and work backwards, with Monday being Monday a week ago. Once you have completed this please answer the statements below the table. Please double check that you have filled in the number of units for all fourteen days.

Last week:

Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday

Previous week:

Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday

Appendix G:

Statistical Power

Statistical Power

Power is the probability of detecting an effect, if one actually exists. A power analysis was conducted to determine the necessary sample size needed for the study to meet power. The power analysis was performed a-priori (prior to commencing the study) which is generally considered the best way of determining power. The analysis was performed using G*Power (version 3.1.0). Based on Cohen's (1988, 1992) recommendation, the aim was to recruit sufficient numbers in order to detect at least a medium effect at a power of .80, with an alpha of .05. For the t-test and the ANOVA to detect a medium effect ($d = .50, f = .25$) a sample size of 128 (64 participants per group) was required. Based on the sample size recruited (64 alcohol-dependent, 52 light drinkers), we can assume that this study had reasonable power.

References

- Cohen, J. (1992). A power primer. *Psychological Bulletin*, 112(1): 155-159.
- Cohen, J. (1988). Statistical power analysis for the behavioral sciences (2nd ed.). Hillsdale, NJ: Erlbaum.

Appendix H:

Data Screening

Data Screening

Prior to statistical analysis, the data were checked for normal distribution (skew and kurtosis) and homogeneity of variance/homoscedasticity. This was done using graphs (histograms and boxplots), z scores and tests (Levene's test). The data was split into two: the alcohol-dependent group and the light drinkers group. Graphs and figures revealed skewness and kurtosis and a Levene's test revealed that the variances were significantly different between groups on some of the variables. To overcome this bootstrapping (Efron, 1979) was used where possible.

Normality allows us to infer that the sampling distribution is normal and lack of normality prevents us from knowing the shape of our sampling distribution. Bootstrap resolves this problem by taking the sample as a population from which smaller samples (called bootstrap samples) are taken. The mean is calculated for that bootstrap sample and put back into the overall sample. This is repeated 1000 times so that we end up with 1000 means. SPSS orders them and works out the percentile bootstrap confidence interval (where 95% of them fall). Then the standard deviation is calculated from the bootstrap samples and is used as the standard error of the means. Due to bootstrapping being based on random sampling, the estimates are slightly different each time you run the analysis; however, this is supposedly not a concern (Wright, London, & Field, 2011). Bootstrapping is based on the central limit theorem which proposes that if your sample is large enough, the means will be distributed normally regardless (Trotter, 1959).

Bootstrapping was used for the t-tests and correlational analysis. The correlational analysis was performed one-tailed due to the hypothesis; however, a two-tailed correlation did not change the main effects. Correlations were performed with the Bootstrap function and without and the effects remained the same. For the mixed ANOVA the bootstrapping function was not available. Transforming the data was not a sensible option due to some

variables being positively skewed and others being negatively skewed: therefore, the same transformation could not be applied across variables. A decision was made to perform a mixed ANOVA regardless of assumptions not being met; however, a Mann-Whitney non-parametric test was also performed to compare differences between groups on attentional bias scores. Consistent with the ANOVA no significant difference was found.

References

- Efron, B. (1979). Bootstrap methods: Another look at the jackknife. *Annals of Statistics*, 7, 1–26.
- Trotter, H. F. (1959). An Elementary Proof of the Central Limit Theorem. *Archiv der Mathematik*, 10, 226-234.
- Wright, D.B., London, K., & Field, A.P. (2011). Using bootstrap estimation and the plug-in principle for clinical psychology data. *Journal of Experimental Psychopathology*, 2(2), 252-270.

Appendix I:

Visual Probe Task

Visual Probe Task

The visual probe task (VPT), also known as the dot probe task, was developed by MacLeod, Mathews and Tata (1986) to assess selective attention. Participants are seated approximately arm's length in front of a computer screen. They are asked to stare at a fixation cross on the center of the screen. Two stimuli, one neutral and the other related to the subject matter (in this case alcohol) appear randomly on either side of the screen. The stimuli are presented for a predetermined length of time, before a dot is presented in the location of one of the former stimuli. Participants are instructed to indicate the location of this dot as quickly as possible by pressing one of two buttons on the keyboard.

The VPT has been shown to be capable of measuring attentional bias in heavy social drinkers (Townshend & Duka, 2001; Field et al., 2004) and is a common tool in addiction research (Lubman et al., 2000; Ehrman et al., 2002; Field, 2006). Unlike the Stroop task the VPT allows you to manipulate how long the stimulus is presented for. Studies typically used two durations, a short (e.g. 50ms) and longer duration (e.g. 500ms). However, Ataya et al. (2011) claim the measure has poor internal reliability and some suggest that VPT tasks which measure eye movements may be more reliable (e.g. Field & Christiansen, 2012). For pragmatic reasons, and to be consistent with other studies in this area, the VPT was used in the current study.

The VPT used in this study was based on the VPT in Field et al. (2013). The laptop was a Pentium II PC with a 15" monitor. The software used was MEL version 2.01. All pictures were 95mm high x 130mm wide and spaced 30mm apart. Participants completed 12 practice trials (containing no alcohol cues) before commencing the main trials. The fixation cross was presented for 500ms before the picture pairs were presented for either 50ms or 500ms. The stimuli consisted of alcohol-related pictures e.g. beer, spirits, an off-licence and someone drinking) and neutral pictures (stationary, a mug, someone drinking water) and were

matched for complexity and brightness. The pairs consisted of alcohol pictures paired with neutral pictures and neutral pictures paired with neutral pictures (neutral-neutral trials). Neutral-neutral trials were used to check whether any attentional bias reflected quick orienting or slow disengagement. Picture pairs were displayed for 50ms or 500ms. Following this a visual probe (white dot) appeared on the screen replacing one of the pictures. Participants were asked to respond to the probe as quickly as possible by pressing the appropriate button on the keyboard and reaction times (RTs) were recorded. There were 176 trials in the main block comprising 16 neutral-neutral trials, 36 congruent trials (probe replaces an alcohol picture) and 36 incongruent trials (probe replaces a neutral picture); 88 for each stimulus onset asynchrony (SOA; 50ms, 500ms). The probe and alcohol and neutral cues were presented an equal number of times on both sides of the screen. The trials were presented in a new random order for each participant. Attentional bias was calculated by subtracting RTs to alcohol congruent trials from RTs to alcohol incongruent trials. Positive scores indicated attentional bias for alcohol-related pictures.

References

- Ataya, A. F., Adams, S., Mullings, E., Cooper, R. M., Attwood, A. S., & Munafo, M. R. (2012). Internal reliability of measures of substance-related cognitive bias. *Drug and Alcohol Dependence, 121*, 148-151.
- Ehrman, R. N., Robbins, S. J., Bromwell, M. A., Lankford, M. E., Monterosso, J. R., & O'Brien, C. P. (2002). Comparing attentional bias to smoking cues in current smokers, former smokers, and non-smokers using a dot-probe task. *Drug and Alcohol Dependence, 67*, 185–191.

- Field, M. (2006). Attentional biases in drug abuse and addiction: cognitive mechanisms, causes, consequences, and implications. In M. R. Munafo, & I. P. Albery (Eds.). *Cognition and Addiction* (pp 73-99). Oxford: Oxford University Press.
- Field, M., & Christiansen, P. (2012). Commentary on Ataya et al. (2011), 'Internal reliability of measures of substance-related cognitive bias'. *Drug and Alcohol Dependence*, 124, 189-190.
- Field, M., Mogg, K., Mann, B., Bennett, G.A., Bradley, B.P. (2013) 'Attentional biases in abstinent alcoholics and their association with craving'. *Psychology of Addictive Behaviors*, 27(1), 71-80.
- Field, M., Mogg, K., Zetteler, J., & Bradley, B. P. (2004). Attentional biases for alcohol cues in heavy and light social drinkers: the roles of initial orienting and maintained attention. *Psychopharmacology*, 176, 88-93.
- Lubman, D. I., Peters, L. A., Mogg, K., Bradley, B. P. and Deakin, J. F. W. (2000). Attentional bias for drug cues in opiate dependence. *Psychological Medicine* 30, 169–175.
- MacLeod, C., Mathews, A., & Tata, P. (1986). Attentional bias in emotional disorders. *Journal of Abnormal Psychology*, 95, 15–20.
- Townshend, J. M., & Duka, T. (2001). Attentional bias associated with alcohol cues: Differences between heavy and occasional social drinkers. *Psychopharmacology*, 157(1), 67–74.

Appendix J:

Lay Summary

Lay Summary

The following summary is for participants and staff who expressed an interest in the results of the study.

The aim of this research was to investigate the relationship between thought suppression and motivational conflict. Motivational conflict can be described as the motivation to use alcohol (approach alcohol) at the same time as the motivation to not use alcohol (avoid alcohol). It is thought that motivational conflict is central to alcohol dependence. Thought suppression is a mental strategy that people who are trying to abstain from something often report using e.g. smokers trying to abstain will try to avoid having thoughts related to smoking. However, the research suggests that this strategy can have the opposite effect i.e. they often end up having more thoughts about the thing they are trying to avoid.

We were interested in how avoidance motivation and thought suppression relate to one another. To investigate this, we recruited 64 adults undergoing treatment for alcohol dependence and 52 light drinkers. All participants were asked to complete a computer-based dot task and questionnaires. During the dot task participants were shown alcohol and neutral pictures and then a dot would replace one of the pictures. The pictures were shown for either 50ms or 500ms.

Prior to the study we made some predictions. We thought the alcohol-dependent group would report higher levels of thought suppression. We also predicted that compared to the light drinkers, the alcohol-dependent group would show an avoidance pattern for alcohol pictures presented for 500ms (i.e. shift their attention away from alcohol when the picture was presented for longer). We thought that thought suppression might play a key role in this i.e. we thought that the alcohol-dependent group would be more likely to suppress alcohol-

related thoughts and hence would be more likely to make a conscious effort to avoid alcohol pictures when presented for 500ms (more time to process the pictures).

Results

The alcohol-dependent group reported higher levels of thought suppression in general and in relation to thoughts about alcohol. The alcohol-dependent group reported higher levels of approach and avoidance tendencies in comparison to the light drinkers on the questionnaires; however, there were no significant differences between the two groups on the dot task as expected

The results suggest that people undergoing treatment for alcohol dependence are likely to use thought suppression to avoid thinking about alcohol. These findings have implications for the assessment and treatment of alcohol dependence. This research highlights the importance of identifying the strategies that people use whilst trying to abstain and educating people about their unhelpful effects. Mindfulness-based treatments which encourage people to accept their thoughts could prove useful.

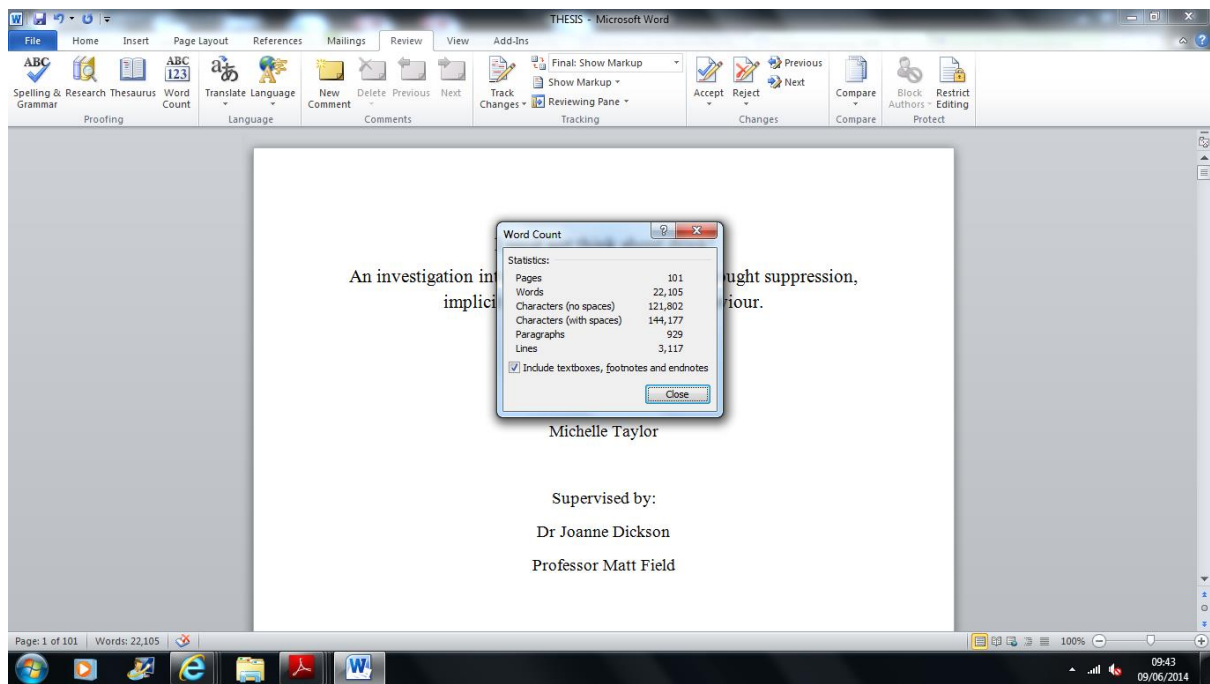
Thank you taking part in the research.

Michelle Taylor

(Trainee Clinical Psychologist, University of Liverpool)

Appendix K:

Word count



Systematic Review: 4890

Empirical paper: 3989 (excluding table and abstract)

Total (inc. references and appendices): 22,238